# The Electrical Review

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# Electrical Industry

THE bearing of economic conditions throughout the world upon the electrical industry receives attention in two important statements this week. Both are abstracted elsewhere in this issue, but they justify comment here as well.

The speech of Sir Felix Pole, as chairman of Associated Electrical Industries, Ltd., possesses particular interest because that company's manufacturing operations at home extend through many subsidiaries engaged upon all classes of products, while its trading connections overseas keep it constantly acquainted with the course of affairs in most countries.

The reduction of dividend is due to the policy, which everybody will consider perfectly sound in the circumstances, of charging against profits all exchange losses in connection with trading and depreciation of investments overseas. If there had been a revival of trade this year they might have been charged against reserve, but anticipations of such a revival have not been realised, and the resources are to be conserved.

The results of trading, however, are regarded as satisfactory bearing in mind the unparalleled condition of affairs nationally and internationally. "To a company trading all over the world . . events occasioned tremendous difficulty and loss." Financial and exchange complications in many countries are still making commercial transactions almost impossible, while world trade is disorganised by the fall in prices of primary commodities so that purchase of manufactured goods is either restricted or stopped altogether.

Our national change of trade policy is welcomed in the belief that it will assist home manufacturers and provide means for negotiating fair trading arrrangements, but at the same time the existence of certain competition among home producers is stated to be leading to a productive capacity in some branches in excess of requirements.

The associated companies have long devoted a great deal of money and patience to electrical research work of various kinds. This shows its effects in many ways in efforts to improve, cheapen and extend its products.

Railway electrification contracts already carried out by the associated works justify the hope that much more will follow when the overdue electrification of suburban lines is put in hand, as it may be after the Government's decision regarding the London Traffic Bill has been given. Another department which is expected to bring grist to the mill of this and other companies is the electric propulsion of ships. "The advantages of this form of propulsion are so outstanding that its extension is inevitable," said the chairman.

But what is the outlook now? Sir Felix finds it little, if any, clearer than when he spoke a year ago; then he said it would be "rash to speak about future prospects." To-day the report says that "with more settled economic conditions a revival in trade may be anticipated." Can anybody say anything more definite? One of the chief grounds for encouragement is to be found in the fact that Britain is showing a definite increase in her national consumption of electricity. This aspect was considered in the other statement to which we refer—the report of "Sofina" for 1931.

Increased use of electricity is essential to the development of the world's resources and this great work will make ever-growing demands upon the electrical industry.

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**Splitting the Atom**

IT has long been recognised that the atom is "indivisible" only in the chemical sense; more recently the property possessed by some of the heavier elements to give off alpha rays (positively charged particles) spontaneously gave physical proof of the atom's instability. The discovery of Dr. Cockroft and Dr. Walton that atoms of hydrogen can be broken up into helium takes us a stage farther in our knowledge of the ultimate constitution of matter. The method adopted was to bombard the lightest of the elements with protons (positive nuclei of the atoms) shot through a vacuum tube at speeds depending on the voltage applied. Disintegration is reported to have started at the relatively low pressure of 120,000

volts. The energy of the expulsion of the helium atoms was sometimes as much as 160 times that of the bombarding protons, but this does not mean that there is any probability whatever of increasing the amount of useful electricity due to the transmutation of mass into energy by atomic disintegration. Atoms are believed to be exceedingly porous, so that most projectiles go straight through them; this causes an inherently low conversion efficiency, since millions of particles must be fired before the law of chance results in one of them hitting its target.

**E.M.M.A. Returns Home**

IN 1928, on the ground of incompatibility, half a dozen of the leading members of the Electrical Wholesalers' Federation pronounced a judicial separation on their own behalf and formed a new body—the Electrical Merchants' and Manufacturers' Association ("E.M.M.A."). Now, however, after three or four years of splendid isolation, the breach has been healed, all is forgiven, and E.M.M.A. is returning home. But, to drop the conjugal simile, we are very pleased to see this reunion. The industry already has too many trade associations, and where, as in the case of these two bodies, similar interests are involved the situation is reduced to the absurd. The E.W.F. is especially to be congratulated, for without the support of the six important separatist firms it could not be said to represent the wholesale side of the industry. As for the six, in spite of their eminence, they could not hope to form more than a "cave" in the industry, and their combination must have been little better to them than complete independence.

**Railway Operation Costs**

ALTHOUGH railway electrification brings with it many advantages that cannot easily be expressed in monetary saving, it is on the latter that any decision to electrify will turn. Reports from France show that the running and maintenance costs of the electrified rolling-stock on the Paris-Orleans railway are about 2.4 fr. per train-kilometre less than with steam. This result is regarded as good enough to continue the conversion, and a further 700 kilometres is to be changed over. This should allow fuller utilisation of the electric tractors now running, and consequently a still more favourable comparison with steam haulage.

**Sound Advice**

IT is gratifying in these days of striving after cheapness rather than quality to hear from the Chancellor of the Diocese of Chester some very sensible guidance. Addressing a meeting of representatives of the various parishes, Sir W. Baker-Wilbraham said that it was important that electrical work in churches should be undertaken by reputable firms, especially in the case of ancient buildings where a higher standard of safety was necessary. Churchwardens should choose the most competent firm rather than the lowest tender, and the work should be supervised by an expert. The Chancellor also referred to church lighting methods, and suggested that floodlighting was the best method of illuminating naves and chancels. It is to be hoped that wide publicity will be given to the Chancellor's remarks in Church circles, for that false economy which is actually a waste of money is too often pursued by church authorities with straitened means.

**Sofina**

THE report of the directors of Sofina, otherwise known as the Société Financière de Transports et d'Entreprises Industrielles, is a remarkable one. The mere thought of reading seven newspaper columns of small type in order to find out what it is all about is enough to make one's head ache in advance, but when it is found that this is merely an abridgement of the original, placidity takes the place of perturbation. What then, in a few words, is it all about? Sofina owns many electrical undertakings all over the world, and it finds that, in spite of all economic and other disturbance, practically all of these undertakings have maintained their output. In general, it has found, like many concerns in this country, that increased sales of energy for lighting and domestic purposes have set off the decline in industrial consumption. Here there is nothing unduly brain-racking, but when we plunge into a full discussion of the world crisis, its causes and its cure, the questions of rationalisation, mechanisation, and unemployment. Mr. D. Heineman, who is responsible for the review, enters into such matters as the evils which have been attributed to technical development, and to the place of technical progress as a source of employment and well-being, as well as of economy. He examines the causes of unemployment crises; discusses the remedies for the present one; explains why the development of electricity continues, in spite of depression; and points to the growth of the electrical industries as a striking example of the benefits of technical progress. Here, however, we must stay our hand, for if we attempt to discuss the whole matter we shall have room for nothing else. We must refer the reader to the abstract which appears on another page of this issue.

**Electric Welding for Ships**

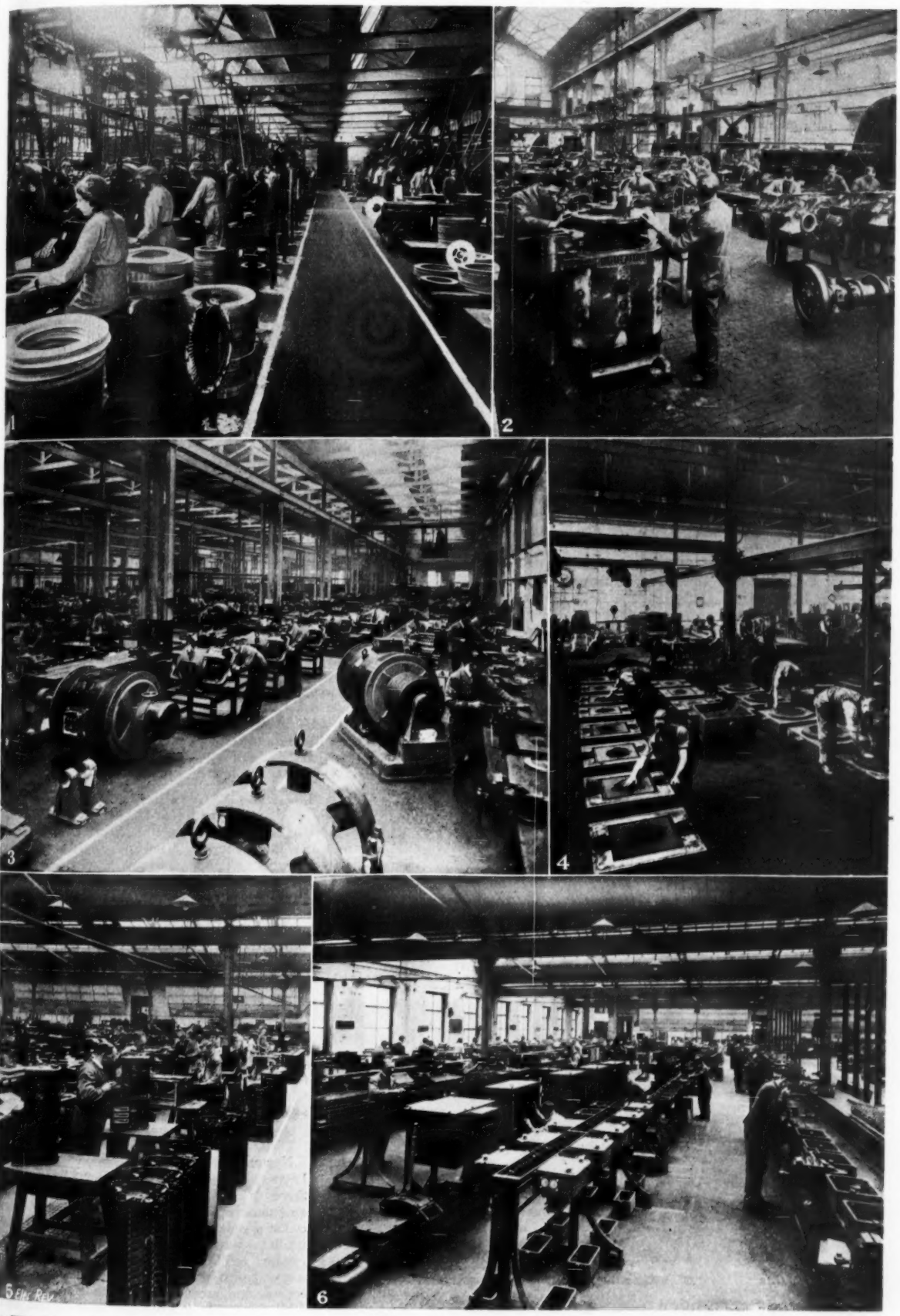
IN the course of an article in a financial daily on industrial electric heating, reference is made to the possibility of constructing ships without the use of a single rivet. The scope for electric welding in this direction is very large indeed. Recently Mr. H. Hunter, manager of Swan, Hunter & Wigham Richardson, who built the *Mauretania*, expressed the view that we were on the eve of a revolution in ship construction through the development of electric welding. He also stated that some builders were prepared to quote lower prices for all-welded ships, as it appeared possible to provide a welded structure that was not only stronger than a riveted structure, but from twelve to twenty per cent. lighter. Thus the need for economy is once more the opportunity for electricity.

**The Contractors' Conference**

THE preliminary programme of the annual conference of the E.C.A. and Allied Associations, which is to be held at Southport from June 28th to 30th, shows that the arrangements which have proved so successful in previous years are again being followed. There is one innovation, however; the proceedings are to commence on Tuesday instead of Wednesday. We suspect that this is to encourage delegates to spend a long week-end in Southport at the close of the conference. Or maybe this year's business is to be so intense that an extra day's recuperation will be essential. The president (Mr. W. R. Rawlings) will receive the members at the usual social function during the evening of the first day. The second day will be taken up by the annual general meeting, a civic reception and a paper and discussion. A second paper will be read and discussed on the third and last day; there will be the usual garden party in the afternoon and a ball and supper in the evening. Opportunities for contractors to "get together" in a national way are so rare that the conference should be well supported—quite apart from the fact that Southport will provide a pleasant respite from the weary struggle for existence which we are led to believe is the contractor's lot.

**An Unnecessary Stage**

SPEAKING at the Coal Trade Luncheon Club recently, Mr. A. E. Dunstan prophesied, in connection with the heating of large buildings, that the solid coal era would be followed by a gas era, which would in turn be succeeded by an electricity era. In view of the success that has already been obtained in the heating of buildings electrically, the intervening stage of gas heating seems quite an unnecessary assumption.



**The English Electric Company's Works which are being visited by the Birmingham Electric Club to-day (Friday)**

1. Punching laminations in the press room. 2. Traction motor erection bay. 3. Industrial motor erecting shop. 4. Preparing moulds in the foundry. 5. A section of the traction control gear department. 6. Assembling industrial control gear.

# A Supply Exchange Scheme

## Public and private systems in parallel

THERE is unusual electrical interest in the new power station at Beeston, Nottinghamshire, of Messrs. Boots Pure Drug Co., Ltd., which is designed mainly to serve the existing soap factory and the new main factory now under construction, on site, with process steam. The steam and electrical demands of the works do not balance; further, the variations in both demands are such that at any time the call for steam may be greater than that for electricity, and vice versa.

To appreciate properly the fundamental considerations which led to the scheme, it is well to stress the fact that the consumer (from the public undertaking) does not regard the generation of electricity in a competitive sense, but rather as a by-product from the main objective—steam.

Mr. C. H. Jessop, the company's engineer, who has been responsible for the installation, told us that three per cent. of the steam charges, when on process, are charged to electricity generation, with the result that normally he can produce electricity at under 0.3d. per kWh. Thus, his opinion that the taking of a supply from the public undertaking when the electrical demand is greater than the steam demand should be reciprocated when the conditions are reversed appears to be quite reasonable.

While we have some sympathy with the public suppliers' view that their business is to sell electricity and not to buy it, we congratulate the Derbyshire and Nottinghamshire Electric Power Co. on the spirit of co-operation which it has shown in falling in line with these ideas.

It seems to us also a reasonable stipulation of the public concern that the supply that it takes from the private company should be limited, but where the limitation mark should be is too fine a point for discussion in this article.

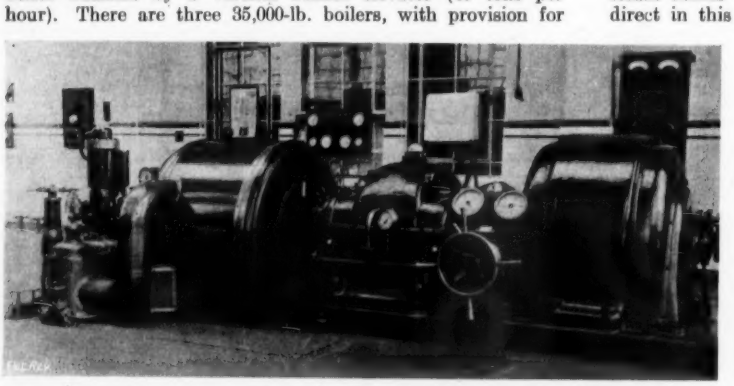
Energy from the Derby and Notts Co. is received at 11,000 V and transformed down to 400 V in the station by a 650-kVA transformer. Generation in the power station is at the lower pressure, 50 cycles, three-phase, at which the two supplies are floated on the main bus bars, a panel on the main switchboard serving in precisely the same manner as an ordinary generator panel.

The incoming and outgoing supplies are metered at 11,000 V on a simple switch panel directly on the end of the supply company's main, two meters being similarly connected but ratcheted in opposite directions to register the "in" and "out" supplies, respectively.

From the point of view of operation the most interesting thing about the station is the electrical load adjustment according to the steam demand, or more directly to the exhaust-steam pressure. While in the turbine room we had the interesting experience of seeing the exhaust pressure brought from about 50 up to 60 lb. per sq. in. by increasing the load on the generator by some 50 kW. We left the correct designation of the "switchboard attendant" undecided.

### Boiler Equipment

Coal is received by rail and emptied into an underground bunker from which it is conveyed directly into the overhead boiler bunkers by a vertical bucket elevator (40 tons per hour). There are three 35,000-lb. boilers, with provision for a fourth. They are of the Babcock and Wilcox tri-drum land type, because of the necessity for large water capacity on account of the very wide variations in steam demand.



One of the 1,000-kW condensing turbo-alternator sets

The B. & W. compartmental stokers are similar to the Underfeed "L" type. The furnace bed space is 14 ft. wide by 12 ft. front to back. The stoker of the latest boiler is driven through eight-speed gearing, and the other two through four-speed equipment.

There are no ordinary economisers, but the installation of air preheaters and feed-water heating arrangements indicates, for a comparatively small installation, to what degree the efficiency of steam generation is regarded. The air preheater is included in the structure at the back of each boiler unit, and is of the contra-flow type, cold air entering at the base for its journey up and down on the outsides of the vertical tubes, en route to the furnace through external side ducts, while the flue gases pass through the tubes on their way to the shaft.

Back of boiler; entrance to preheater and shaft

As soon as the temperature of the feed water in the "Neckar" water softener falls below 160 deg. F. steam from a branch of the l.p. steam main is ejected into it. Each boiler is fitted with a Lea feed-water recorder, and all are served by Diamond soot blowers.

Balanced draught is employed, the forced draught fan being placed between the air preheater and the fire. One induced draught fan (58 h.p. motor, 480 r.p.m.) serves a pair of boilers each of which has its own forced draught fan (32 h.p. motor, 725 r.p.m.). One chimney serves two boilers. On induced draught only the chimney-base flue-gas temperature is about 450 deg. F.; balanced draught brings this figure down to 300 deg. F. All the fans are situated in the boiler-house basement.

### Steam Conditions

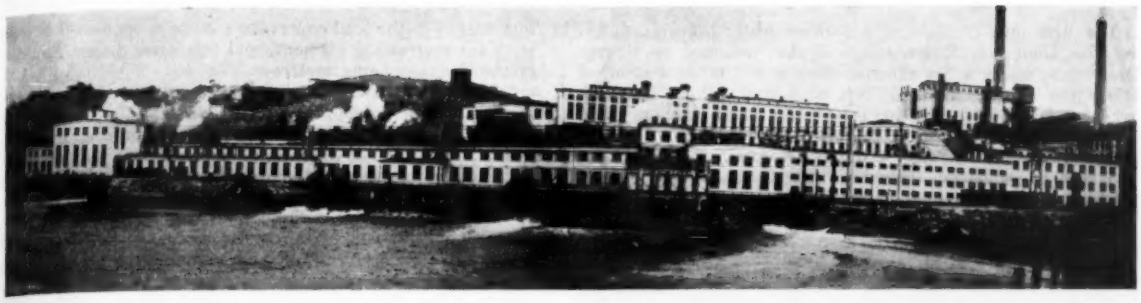
The boiler steam conditions are 350 lb. per sq. in. and 650 deg. F., and the steam at this pressure is passed to reducing turbines which exhaust it at 60 lb. per sq. in. for process work in the factories. But steam for the works is at times required direct from the boilers—the steam demand may be greater than the electrical demand, or the turbines may be down for repair, &c.—and this is provided for by a direct connection between the h.p. and l.p. steam mains *via* a pressure-reducing valve. Steam supplied direct in this way is desuperheated to 450 deg. F. A cylindrical jacketed container is subjected to cold-water sprays. The cold water is converted into steam in the jacket and passed into the l.p. main.

The boilers are served by two Weir steam-turbine feed pumps, 5,000 r.p.m., each of which deliver 70,000 lb. of water per hour against the boiler pressure.

### Generating Plant

Normal electricity generation is by two 1,000-kW reducing turbo-alternators, while there is a 750-kW condensing turbine for emergency purposes. The turbine and alternator speeds in each case are 6,000 and 1,500 r.p.m., respectively, the reduction being effected by David Brown double helical gearing. The alternators are enclosed and air cooled, and are equipped with Gent electrical temperature control apparatus (Cambridge instruments) with alarm signals. The turbines, alternators, and switchgear were supplied by the General Electric Co., Ltd.

An interesting part of the turbine-room equipment is an air compressor serving the works. It is driven by a B.T.-H. a.c. commutator variable-speed motor, 110-36.6 h.p., 720-240 r.p.m. Many motors of this type are employed in the works; their advantage is that at 1,000 r.p.m. they are synchronous machines, with consequent help to the system power factor.



# The Powell River Development. By F. H. Fullerton

## Power for a British Columbia pulp and paper plant

THE Powell River Pulp & Paper Company recently completed the development of additional power to operate its pulp and paper plant in the company's town of Powell River, B.C. This development added 24,800 h.p. to the company's plant capacity and is the initial unit of a series of proposed developments. The project is part of an $8,000,000 expansion programme which includes the installation of an additional machine at Powell River, approximately seventy miles north of Vancouver on the B.C. coastline.

The company established its first pulp and paper mill in 1910 and undertook its first major expansion programme in 1925, when the power plant equipment was increased by the addition of a 13,500-h.p. vertical turbine driven generator and two 6,180-h.p. turbines directly connected to pulp grinders.

When the company decided to develop the Lois River project in 1929 it planned a concrete dam of the veritable radius arch type, but later it was decided to proceed with a temporary dam and construct the permanent dam at a later date. A steel penstock with surge tank and one vertical shaft unit of 18,000-kVA capacity in the power house was also included in the initial development. The temporary dam was erected at a distance of approximately 2,500 ft. by stream from the site of the permanent dam, so that when construction of the latter is commenced the temporary log crib and wood stave pipe will serve as a diversion.

Main dam, Powell River

With the same object in view a Johnston valve for the second unit was installed at the time of the initial development and connected to the tail race by means of a temporary steel nozzle. The temporary log dam at Lois River is of standard construction and is 47 ft. in height above the bed of the river. The dam is flanked by removable flash boards which allow an additional six feet of storage. In the construction of the dam the lower logs were allowed to bridge the stream, so that the flow was uninterrupted when the dam was building.

As construction was proceeded with the dam was split into several compartments and all but the three central compartments were filled with rock. As soon as the dam had reached the required height a small wood sheet piling and earth dam was erected across the mouth of the lake proper. This caused the flow to back up for a period of a few days into the lake. During the few days thus given the cut-off trench at the upstream phase of the dam was excavated, the toe seal installed, and concreted in. Filling was then commenced on the central cribs and the sheeting erected. The small temporary dam, which was already showing signs of giving, was then broken and the water allowed to flow and back up behind the new log crib.

### Pipe Lines and Tunnels

Four sections of penstock connect the dam and the power house. The first section, which runs from the temporary dam to the permanent dam site, is a 10-ft. wood stave pipe and this will be eliminated on the completion of the permanent dam.

Below this permanent dam site the penstock is of a permanent nature and this section was built to accommodate the maximum storage capacity of Lois River so that increase in size will not be necessary when the new development is completed following the erection of the permanent dam. This section is a 12.5-ft. concrete pipe and connects up the permanent dam site with a concrete lined tunnel which has been cut through solid rock for a distance of 5,800 ft. This concrete tunnel is of true circular section with 12.5 ft. inside diameter and a minimum thickness of 6 in. lining in the unreinforced sections and 8 in. in the reinforced sections.

Removable steel forms were used in the placing of the lining in the tunnel by pneumatic methods. In the case of both tunnel lining and the pipe continuous pours circumferentially were obtained and construction joints in the pipe were completed with copper expansion shields. The fourth section of the penstock from the tunnel portal to the Stillwater power plant is of all steel construction and has a total length of 2,700 ft. It is tapered from 12.5 ft. to 11 ft. in diameter and forms a "Y" at the power house where two 7.75-ft. branches carry the water to their respective units. Both branches are governed by Johnston Larner valves.

Surge chamber and penstock

The surge tank adopted is of the Johnston differential type, 30 ft. in diameter and 187 ft. in height. The supporting structure is 121 ft. high, so that the total height from the foundation piers is 312 ft.

### The Generating Plant

The power house is situated at Stillwater, on the beach almost at sea level. It is constructed of concrete up to the main floor, while the portion above this is of steel frame with concrete in casement. The power house was roofed with precast gypsum slabs and was placed and poured before the walls themselves were completed.

The Stillwater power station

The first unit consists of a turbine water wheel supplied by the Dominion Engineering Works, designed to deliver 24,800 h.p. under a net effective head of 375 ft. at a speed of 333 r.p.m. and at least 206 h.p. at a head of 325 ft. This wheel is designed for operation over the whole range of effective heads varying from 410 to 325 ft.

The Canadian General Electric Company supplied the 18,000-kVA generator, which is directly connected, 80 per cent. power factor, of the vertical 6,660-V, 50-cycle, 3-phase design. It is of the new all-welded type and is equipped

**Penstock from tunnel to power house**

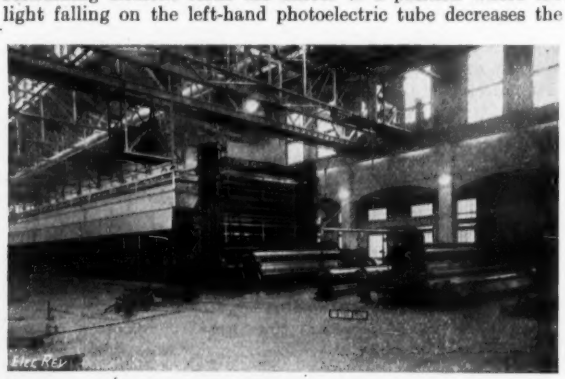
with a directly connected exciter. All the machinery in the plant is designed for automatic operation and control, with duplication of all important units to avoid unnecessary or prolonged "outage."

The control board was supplied by the Canadian General Electric Co., and, in addition to automatic starting and shutdown features, it is provided with equipment for the distant recording of all important loads, gate openings, bearing and winding temperatures, and it also provides for the sounding of alarms at the main generating station at Powell River, thirteen miles away, by transmission line, and at the homes of the local staff in case of undue bearing or winding temperatures, failure of air or oil pressures, or other untoward incidents.

## The Telemeter System

Mr. F. G. Barnes, engineer for the Canadian General Electric Co., in explaining the system, states: "The telemeter in the Lois River station has two elements, one a standard d.c. milliammeter element and the other a standard 'Selsyn,' or temperature meter element. Means are provided for so coupling the two elements that current flowing in the d.c. element bears a definite relation to the torque produced by the metered circuit. The current flowing in the d.c. milliammeter element is transmitted over a pair of line wires to the remote indicating instrument at Powell River, which is a d.c. milliammeter with a scale calibrated in terms of the quantity being metered.

"When there is no power on the operating element, the restraining element turns the mirror to a position where the light falling on the left-hand photoelectric tube decreases the



**One of the large paper machines**

output of the 'Pliotron' to zero. This is indicated by a zero reading on the remote instrument in the load supervisor's office. When the power is applied to the operating element the mirror turns, focusing more light on the right-hand photoelectric tube and less light on the left-hand tube, thus increasing the output of the 'Pliotron' until the current flowing through the restraining element produces a torque equal and opposite to balance that of the operating element. The instrument in the load supervisor's office is connected in series with the restraining element, and this gives a true indication of the quantity being metered.

"Since the torque of the two elements must always balance, a variation in the supply voltage will vary the torque of the restraining element. This is immediately compensated for by a small movement of the mirror, which returns the unbalanced current and consequently the restraining element balancing torque to their original values. In a similar manner, compensations are made for variations in the line wire resistance, decrease in emission of the tubes, or brilliancy of lamps. A 115-V a.c. source of control power of approximately 50 watts is required for operating each telemeter. The control power can be taken from the station control power transformer or from the lighting circuit. No power source is required at the dispatcher's office."

## Transmission Equipment

Immediately adjoining the power house a sub-station has been built for the accommodation of six 6,000-kVA transformers and an additional spare one to permit transformers being changed. Power is stepped up from 6,600 to 66,000 V for transmission to Powell River. The high-voltage switching yard is immediately adjacent to the transformer platform and also accommodates the lighting protective equipment. All switchgear is of the metalclad type and was supplied by the Canadian General Electric Co.

An interesting feature of this installation is the fact that the transmission line was the first unit to be completed. It was "hooked up" to the existing plants of Powell River and power was carried over it to the scene of construction at Lois River. On the completion of the Lois River project power is now transmitted in a reversed direction from the new power plant to the paper mill at Powell River. Ultimately the company will erect two separate lines, which will be spaced 100 ft.

**The temporary dam**

apart and will consist of three conductors of steel-cored aluminium cable supported on cedar poles.

## A 375,000-kVA Generating Unit

IN the United States there has always been a tendency towards the development of very large steam generating sets. The limitations of single unit machines are the magnetic, electrical, and mechanical characteristics of the various components. To increase the diameter of the rotor above the present values would necessitate a change from copper to aluminium field coils in order to reduce centrifugal force. Little increase of output can be obtained by lengthening the rotor, which increases also floor space and building costs.

A multiple-element generator, however, utilising the large head room usually available above the set, and keeping the length within reasonable limits, has been proposed in the United States. This type of set consists of a fairly high power factor main generator directly connected to a steam turbine, with one or more synchronous condensers, running free, mounted above the generator. The multiple-element generator is considered to function in just the same manner as a single unit machine, delivering a certain kVA output at a definite power factor. The maximum output is at unity power factor, and the corresponding combined maximum ratings of the 1,800 and 3,600 r.p.m. multiple- element generator units would be 375,000 kVA and 100,000 kVA at 0.8 power factor.

The synchronous condenser supplies the reactive kVA. With the most economical combination the main generator will deliver full kVA rating at 0.9 to 0.95 power factor, and the synchronous condenser carry 0.2 to 0.25 kVA of the combined 1.0 kVA, 0.8 power factor rating. The present limits of single unit generators at 0.8 power factor are as follows:—

| | 1,800 R.P.M. kVA. | 3,600 R.P.M. kVA. |
|---|---|---|
| Conventional design, air cooling | 225,000 | 43,750 |
| Modified design, aluminium field coils, air cooling | 250,000 | 62,500 |
| Modified design, aluminium field coils, hydrogen cooling | 285,000 | 72,500 |
| Multiple element generator, aluminium field coils, air cooling | 375,000 | 100,000 |

# The Open Mind

WRECKAGE has always bestrewed the pathway of invention. Strange freaks of the intellect, contrivances both pitiful and laughable, the most unpractical ideas and the most ludicrous suggestions—or so they have appeared at some period or other—have mingled together with unfulfilled hopes and unrealised ambitions, piling up a peculiarly assorted scrap-heap.

Our own editorial experiences of inventors who have enthused, of inventions that have amused, and marvels of ingenuity that have never possessed a ghost of a commercial chance, would fill a book. The secret of perpetual motion had been revealed to those who certainly aroused suspicion that they were possessors of perpetual youth! Of course many good things—hundreds of them—have come along, but no doubt some things, most excellent in their way, which deserved a better fate, have found their way to the limbo of things born out of due season because there was no patron at hand to help the struggling inventor, or to bear the cost of continuing his patient research and his pleasant dreams.

Years ago one of our men of eminence addressed us upon the unsolved problems of electrical engineering. How many of us to-day might enjoy the exercising of our imagination in preparing a list of electrical things or electrical applications that have never yet been thought of, or, if thought of, have failed to take practical shape!

We welcomed the report that reached us last week of the invention of an electric bicycle, and its production on the Continent, partly for what it was in itself, but more because of what it stood for—a departure from the beaten path of electrical achievement. Sometimes when the electrical man settles comfortably down amongst his super-power station and grid ideas, he would be the better for a little shaking up accompanied by an urgent exhortation that he should look up, and out, and onward for the approach of something totally new. What is being done electrically is as nothing compared to what may be—is it not as true in this sense as it is false in others that electricity is still in its infancy? Who, when he is at his best, can set any limit to electrical originality or electrical possibility? We may all have electric motor-bikes sooner than we think! We may even take our flights in electro-planes—at any rate in fancy, if not in fact. (Was not the ELECTRICAL REVIEW writing on aviation decades before the Channel was flown?) Electric launches which have tarried for more than forty years may become as numerous on the river as blackberries elsewhere in autumn.

The great thing which will redeem the very prosaic electrical industrial life of many of us is an open mind—no laughing a matter out of court with "It can't be done!" when some enthusiast pours forth nineteen-to-the-dozen the features, merits and hopes of the child brought forth through the conception in his brain. Even in such a matter as the national supply of electricity, apparently well established, as Mr. Woodhouse reminded us at the Power Companies' luncheon, we must have this open mind; but he also made it clear that one of its accompanying requisites was a good reserve!

How practical we have suddenly become in mentioning it thus—dropping from visions to finance! Yet in the electrical industry experience has taught us again and again how essential it is that we should have this open mind, should possess this good reserve. We must have the open mind so that we shall welcome everything that will give improvement.

Mr. Woodhouse tells us, and it is perfectly sound advice, that we must be ready to take advantage of every new invention; that every new piece of apparatus must be considered and that there must be research, maintenance and replacement on a scale which will keep the industry "ahead of progress" and assured of continued development. Such words as obsolescence and supersession—how much they have meant to us as we have scrapped the once-best and the once-most-efficient for the vastly better and the more efficient. Given the accumulation of the good reserves we have not quailed in presence of the change and decay that have relentlessly consigned our favourites to the scrap-heap; but without that provision what disaster has ensued!

There have been remarkable changes in electrical engineering and its industries during the past forty or fifty years. Some of them have taken our forbears by surprise, but, on the whole, the electrical industry has shown a remarkable ability to adjust itself to change. Comparatively few of the supersessions in type and class of product that we recall have occasioned the disappearance of electrical companies. Some have gone, it is true, but generally from quite other causes. We have amongst us concerns of eminence which have faced change with foresight and fortitude and won through to great success; and that will doubtless happen again.—A. H. B.

**Some Driving Forces in the Industry: Leading Figures of the Ferranti Organisation**

1. Mr. D. Z. de Ferranti, manager of the Meter Dept. 2. Mr. V. Z. de Ferranti, M.C., chairman. 3. Mr. R. H. Schofield, general sales manager. 4. Mr. G. L. Porter, advisory engineer. 5. Mr. R. J. Hebbert, assistant sales manager. 6. Mr. A. Hall, engineer in charge of wireless development. 7. Mr. E. T. Norris, chief designer of power transformers and h.p. appliances. 8. Mr. O. M. Robson, deputy sales manager. 9. Mr. J. Binnie, in charge of the works side of the Transformer Department. 10. Mr. J. Turner, manager of the Transformer Department. 11. Mr. W. Holmes, manager of the Instrument Dept. 12. Mr. W. Tyldesley, secretary. 13. Mr. J. W. Davies, general works manager.

# Securing the Domestic Load. By R.S.H.

## The need for statistical information

THE curves reproduced below show the trend of electricity supply capital charges (generation and distribution) in Great Britain from 1921-22 onwards. The decreased average cost per kWh is due to the improved load factor, for the cost per kW of m.d. on generating stations had returned in 1929 to the 1921 level. Possibly the last two years' figures would have been lower but for the falling-off in the demands of existing consumers, due to trade depression, and the heavy expenditure on system extensions. Nevertheless, there is no good reason for anticipating any substantial change in capital charges in the near future, although these may be advantageously spread over a greater output if the industry as a whole adopts a more vigorous sales policy, particularly with regard to off-peak consumption, with a view to improving the load factor of the energy consumed. The low and falling level of running costs tends to bring nearer the time when a fixed annual charge per connection will be made for an unlimited domestic consumption. In any case for some little time capital charges are unlikely to decrease in anything like the same ratio as running expenses, so that the improvement of load factor is becoming increasingly urgent. As regards heavy domestic consumption, some undertakers still hesitate to adopt a vigorous sales policy, presumably because they are not quite certain that the load is worth while, and, if it is, with what tariffs it should be sought. What is urgently required is an extension of our present statistical knowledge, and this would seem to be a matter which the Electricity Commissioners might appropriately take into consideration.

### Statistics Required

The necessary statistics must tend to reveal those undertakings which have been particularly successful in developing the load on a profitable basis; the effect of the load on load factor and the capital expenditure necessary to meet it; and the nature and level of the tariff or tariffs adopted. The success of an undertaking and its tariffs under each class of supply is to be judged by the number of consumers connected as a proportion of the potential consumers, and the consumption per consumer.

The basis of consumption per consumer alone as set out in the recent I.E.E. paper by Messrs. Dickinson and Grimmitt (Figure 9—hyperbolic curve showing increased kWh consumption per consumer with lower average price per kWh) is not for this purpose a good test. That undertaking which has the highest sales per domestic consumer may be far behind another with a much lower average figure, for, with the tariff at a certain height, only very rich people will be connected and their average consumption may be high.

A lowering of price will lead to the connection of poorer or less "electrically inclined" consumers whose consumptions will be low, so that the average consumption per consumer may fall, but from the point of view of affording a cheap and abundant supply to the maximum number of consumers the undertaking will have improved. Similarly, a high consumption per consumer is obtained by some undertakings by making exceptionally low charges in a privileged central area, so that new extensions to the system are rarely profitable; the result is that the supply is confined to the small number of consumers in the special area.

Then again, the total kWh sold, including power, per head of resident population, as shown in the Electricity Commission's statistics, offers no good criterion; in the first place so far as industrial load is concerned the cost of power alone is rarely the predominant or an important factor leading to the setting up of an industry at any particular place; secondly, the resident population may have no relationship to the working population as may be seen in certain central London areas.

### The Best Index

The tests which suit all the points raised above are: (a) domestic consumption per head of resident population or per unit of domestic floor area, to use the official Tariff Committee's basis; (b) the percentage electrification of power plant in industrial establishments; and (c) the consumption per unit of floor area in shops, offices, and other public buildings.

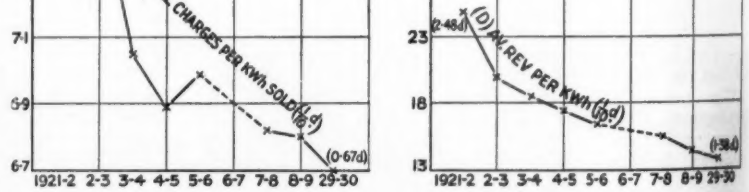
The Commissioners' statistics should be developed on these lines, for such a series of indices would well serve to draw attention to those undertakings which are particularly successful in selling electricity abundantly and cheaply, whether by reason of good tariffs, active propaganda, a rich public, low prices, or for some other reason to be investigated afterwards.

### Load Factor, Capital Expenditure and Tariffs

Information as to load factor and capital expenditure for the domestic load alone is not readily available in many districts. The future of the domestic load is so important that the writer would suggest that the matter is worthy of investigation by an official committee similar to the Rural Conference—the object to be the presentation of reliable information based on the wide experience now available in the industry rather than any series of final conclusions.

Such a body would be able to carry out observations, for instance, in individual sub-stations as to diversity of maximum load in heavy cooker areas as previously advocated in these columns.* Similarly, it would be able to collect detailed information over a wide area as to the effect in all directions of special tariffs for off-peak, alternate switching, and continuous water heating as at Wimbledon.

Finally the Electricity Commissioners should follow the example of the London Joint Electricity Authority and publish details of the actual tariffs under each heading. In particular I would like to see the actual basis of calculation of fixed charges under domestic two-part tariffs which some undertakers appear to be reluctant to reveal to potential consumers.




### Nature of Domestic Tariffs

The principle of cost accounting so far as it affects selling prices is that where the selling price of an article is lower than the cost price the business makes a loss on the sale of such articles and the total quantity sold tends to increase rapidly; on the other hand where the selling price is high in relation to the cost price the total sales tend to be low because the potential consumer may be able to make or purchase the particular article at a cost lower than this high selling price, he may find it cheaper to use a substitute, or else he may be unable to afford to buy at all.

From the curve previously mentioned in Messrs. Dickinson and Grimmitt's recent paper it is concluded that any fall in the average charge per kWh leads to an increased total revenue. This obviously does not necessarily follow, so far as any one consumer is concerned, unless the reduction in average price is followed by an extension in the uses to which the current is applied. The reduction of a lighting flat rate from 8d. to 5d. would clearly lead to an increased revenue per consumer only in exceptional cases. On the other hand a reduction of the average price by the lowering of a heating flat rate or of the running charge of a two-part tariff is much more likely to bring a substantially increased revenue.

The uses of electricity for domestic purposes may extend in two ways; first, it may be adopted for performing a particular

*ELEC. REV., Sept. 5th, 1930.

function hitherto carried out by a competitive commodity because it is cheaper, or because some other good quality such as cleanliness, convenience, or fashion is thought by the purchaser to outweigh the additional cost; secondly, it may be adopted for carrying out a service hitherto not enjoyed by the household because the new service is sufficiently valued by the purchaser to justify the diversion of income to procure it (*e.g.*, electric vacuum cleaners).

The predominant consideration in both cases is the total cost of the electricity and the apparatus; it may be taken that the amount of new revenue from the extension of uses will not substantially exceed that hitherto spent on competitive commodities. The domestic load most easily secured is the cooking load, but the price must not exceed ¾d. per kWh in the London and Home Counties area or gas is definitely cheaper; whether a two-part tariff or a flat rate is used, as at Wimbledon, is not important to the consumer so long as the total cost is low. The advantages of a two-part tariff as regards lighting is not denied.

### Two-part Domestic Tariffs

In general the running charges of two-part tariffs are too high and the fixed charge too low, and so attract the less profitable low load-factor consumers curtailing continuous consumption.

From the figures given in the London Joint Electricity Authority's statistical return it appears that the average running cost per kWh delivered to consumers' terminals for all undertakings in the London area for 1929-30 was about 0.29d., that is, the production of an extra kWh off peak was less than 0.3d. Allowing for a surplus of as much as 33⅓ per cent. per kWh sold for profit and contingencies, the average running charge in the London area need not exceed 0.4d. In point of fact from a strict point of view this figure would yield a surplus of more than 33⅓ per cent. for, as was argued in these columns on May 22nd, 1931, sufficient depreciation should at all times be provided to enable electricity generated by old plant to be sold at the same price as that generated by newest plant.

The figure of 0.29d. is based on the cost at stations having an average generated thermal efficiency of 18.2 per cent.—new steam plant does well over 20 per cent., which would bring the basic figure down to 0.27d.—giving a selling price of 0.35d. per kWh. The London Authority's return shows that the *lowest* running charge in the area for 1929-30 was ¼d. (seven municipalities), giving a margin of at least 66 per cent. over the *average* cost and taking the alternate point of view 89 per cent. in these cases.

### Fixed and Running Charges

Against the suggestion that the running charge should be near the actual cost, it has been argued that it is better to lose money on the fixed charge and to make a bigger profit on the running charge as the existence of a high fixed charge tends to discourage new connections. Apart from the reasons set out above, this policy (which would not stand if the industry were competitive) appears unwise because it is not customary to increase the fixed charge on domestic premises as additional apparatus is installed. Therefore as additional apparatus is added, the loss on fixed costs is greater to the extent of any increase in maximum load should the consumption of kWh fall for any reason.

A compromise which may recommend itself is available and that is, that there should be offered to domestic consumers two or more alternative tariffs; a lower fixed charge with a higher unit charge and then a rather higher fixed charge with a lower unit charge. The effect of this would be that higher consumption consumers would at a certain point find it profitable to transfer to the second alternative; the higher fixed charge would tend to cover the undertaking against increased fixed costs following the connection of additional apparatus by any consumer.

## Automatic Telephones in Johannesburg

WHEN the Department of Posts and Telegraphs of the Union of South Africa commissioned the Automatic Electric Co., Ltd., Liverpool, to equip the Johannesburg telephone area on a Strowger director automatic basis, the network embraced 26 exchanges of various capacities.

The first six to undergo conversion, which were put into public service on March 26th, 1932, were City, 10,000 lines; Hillbrow, 5,200 lines; Auckland Park, 1,400 lines; Kensington, 2,500 lines; Rosebank, 3,500 lines; and Parkview, 2,400 lines, ultimate capacity. In addition, equipment is in process of manufacture and installation for Jeppe, 4,100 lines; Germiston, 1,400 lines; Turffontein, 3,000 lines; and Orange Grove, 3,300 lines. A further seventeen exchanges in the area are planned for conversion, raising the total capacity to 60,000 lines.

The Department of Posts and Telegraphs decided to standardise on Strowger automatic equipment for the area, and aims at complete conversion to the new system by 1949. As the area changes from manual to automatic operation, exchange names will gradually fall into disuse and two digits, known as "characteristics," will take their place.

Central is the main exchange in the area, and all special manual boards are situated there. In addition, it is a main switching centre or tandem exchange. Dialling-in facilities are provided for certain of the outlying manual exchanges to give their operators direct access to automatic subscribers.

For the purpose of multiple metering of calls, the area is divided into zones and the operators' positions in the main manual exchange in each zone are equipped with dials. In the case of Central, with its greater volume of traffic, key-sending equipment replaces dials and expedites handling.

The Strowger line-finder director system is employed in Johannesburg; it operates on six digits, two of which are exchange characteristics. The system differs from earlier installations elsewhere in that practically all the switching mechanisms are of the two-motion selector type, based on the original Strowger switch. Only a very small number of uniselectors (rotary switches) is employed for distributing originating calls by pre-selecting line finders, groups of approximately eighteen of which serve 200-line groups of subscribers' lines.

The function of the line-finder is to hunt for a calling line and extend it to a selector in the first rank in readiness for dialling. The hunting action is partly vertical and partly rotary, both motions being entirely automatic and self-driven. Rotary interrupter contacts are fitted to control the rotary hunting action, which is arrested immediately the calling line is found.

**Views of the City Telephone Exchange, Johannesburg. Left: The switchroom. Right: The test desk**

The line-finder system reduces prime cost, because fewer switches are required per exchange of given capacity, and needs less floor space, in addition to other incidental but important advantages.

The whole of the Strowger equipment for the Johannesburg exchange is mounted on pressed-steel shelves, carried by single-sided racks, another innovation introduced by the company and standardised by the British Post Office.

Over 8,000,000 dial telephones now operate on the Strowger system in 54 countries.

# The Piccadilly Railway Extension

AT a cost of over £3,300,000 the Piccadilly Railway is to be extended westward as far as Hounslow and South Harrow, eventually linking these two towns up with Cockfosters on the north side of London. This scheme necessitates the provision of four tracks in place of the existing two from

**Sudbury Town station**

Hammersmith to Northfields, a distance of four and a half miles. Two new lines have been constructed from the previous terminus of the Piccadilly Railway at Hammersmith to Ravenscourt Park, where use is being made of the disused London and South-Western line to Turnham Green, two new tracks being constructed from here to Northfields, where a new depôt housing 300 cars has been erected. Northfields, South Ealing, Acton Town, Chiswick Park and Hammersmith stations are being entirely rebuilt. The reconstruction work at Hammersmith, which includes the replacement of the two-span brick-arch bridge bearing heavy traffic and tramways by a longer girder bridge of three spans, is proceeding by eight stages, and during the alterations the regular service of 1,457 trains daily is being maintained.

The laying of the four tracks has also entailed the widening of the many bridges between Hammersmith and Northfields. At Acton Town a modern signal cabin with 119 levers is already in use, while west of the station a concrete covered way 450 ft. long has been constructed to enable east-bound trains from Northfields to pass under the eastward line from Ealing, and the flyover bridge carrying the Ealing westward track is being rebuilt during the operation of a full train service.

On the South Harrow line the two existing tracks will be used and a close service maintained by Piccadilly trains alone, a local service of District trains being put into operation between South Harrow and Uxbridge. Many of the stations are being reconstructed on modern lines. At Sudbury Town there is a spacious red brick booking hall, and floodlighting is carried out by two translucent columns.

## The New Rolling Stock

Two hundred and seventy-five new cars (145 motor and 130 trailer) costing £1,000,000 have been ordered for the Piccadilly extension. These cars are two feet longer than the existing ones, and have four doors on each side instead of two.

Considerable improvements have also been made in ventilation and lighting. All the new cars and several existing ones are being fitted with new electric pneumatic brakes and tapfield motors with "all-electric" automatic control. The motors are fitted with roller armature bearings, which are now being standardised for all new motors on the Underground. Shunt-field control, which enables a high rate of acceleration to be maintained up to a greater speed and which also gives a higher maximum speed, is employed. This method of control is suitable alike for the sections in which stations are close together and where they are widely separated. The new trains during heavy traffic periods will be made up of seven cars (three motor and four trailer). Acceleration of 1.5 m.p.h. per sec. is normally attainable, while a balancing speed of 50 m.p.h. can be reached on a level track.

The new brakes are electrically operated Westinghouse pneumatic brakes which can be applied with equal pressure and simultaneously on all wheels of the train. It has been found that with these new brakes the driver can judge his stopping distance to a few inches. Braking rates of 2 to 2.5 m.p.h. can be obtained in regular service.

A new type of heating circuit is also being used so that the guard may control the heaters throughout the train.

**The old and new Chiswick Park stations**

Electric traction equipment for the 145 motor cars has been supplied by the B.T.-H. Co. and 294 motors of 240 h.p. have been supplied by the G.E.C.

# New Buenos Aires Subway

OUR Buenos Aires Correspondent says that on March 18th the Intendente Municipal (mayor) of Buenos Aires decreed approval of the plans presented by the Compañia Anónima de Projectos y Construcciones de Madrid ("CAPYC") for the construction of an underground system of electric railways authorised in 1930. A subsidiary company, the Compañia Hispano-Argentina de Obras Publicas y Finanzas, will control

**The Buenos Aires Lacroze subway**

the actual construction and, according to the decree, two of the four routes to be constructed must be commenced before September 18th this year.

Of the four routes, No. 1 will extend between Retiro Station, the terminus of the Pacific and Central Argentine railways, and Plaza Constitution, the terminus of the Great Southern railway; No. 2 between Parque Chacabuco and Plaza Constitution; No. 3 from the intersection of Avenida Roque Saenz Peña and Calle Corrientes to the intersection of Avenida San Martin and Avenida Gaona; No. 4 from the intersection of Monroe and Cabilda to the intersection of San Juan and Jujuy. The plans for route No. 1 have been accepted definitely and the line must be in service within three years from the date of commencement of construction. Stations are to be built at least eleven metres below street level and provided with mechanical stairways. The plans for routes Nos. 2, 3, and 4 have received provisional sanction for completion by 1938.

The track gauge is to be 4 ft. 8½ in. and two tracks will be laid in a tunnel where the character of the subsoil permits, otherwise the return track will be laid under an adjacent street. Stations are to be built at intervals not exceeding 600 metres from one another, and access to the stations will be from street pavements where the width of the latter permits a passage way for pedestrians of 1.30 metres betwen facades of buildings and access stairways; at other points stations are to be built in line with building facades, the cost of acquiring the sites being debited to the account of the constructors.

## Tariff and Penalties

The concession is for eighty years, and, as a guarantee of compliance with the decree, the concessionaires are obliged to deposit 30,000 pesos (£2,000 approx.) in cash or Argentine bonds for each kilometre of single track to be laid, these deposits being returnable within thirty days of the termination of each route. The tariffs approved are to be ten and fifteen cents (2d. and 3d.), but it is not yet clearly defined how these tariffs will be applied. Should the concessionaires on the termination of route No. 1 delay the construction of the remaining routes within the periods stipulated by the authorities, the latter reserve the right to impose a fine amounting to five per cent. of the gross earnings on the line already built, until construction is continued.

From the general description of the proposed subways and the terms of the decree, it would appear that the new railway will be similar to the Lacroze subway recently opened to traffic, a view of which is reproduced herewith.

# A Hydraulic Slip Regulator

## Electric winder equipment installed at Watnall Colliery

THE first M.V. hydraulic slip regulator in Great Britain has been installed at the Watnall Colliery of Messrs. Barber, Walker & Co., Ltd.

The company's Moorgreen power station, three miles away, was supplying 530 kW at 0.83 power factor to the colliery and adjoining brickworks through a 3-kV overhead line. The voltage drop was 11 per cent., and the winder could not have been added without provision for equalisation by a flywheel motor-generator and Ward-Leonard control. With an induction motor-generator the drop would have been increased to about 18 per cent., and the kVA load on the power station by at least 40 per cent.

The hydraulic slip regulator permitted the use of a synchronous-induction motor-generator, which has raised the power factor of the total colliery load to 0.95, so that the voltage drop with the winder running is only 15 per cent., and the kVA demand has increased by only 24 per cent.

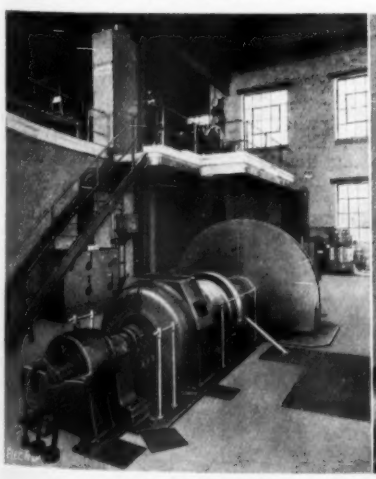
### Driving Arrangements

The 250-h.p. 1,000 r.p.m. synchronous-induction motor drives the impeller and casing of the hydraulic coupling; the runner portion drives the cast-steel four-ton flywheel and 250-kW, 250-V l.c. compensated-type generator, which is directly connected by cables to the winder motor. The impeller is of high tensile aluminium alloy and is overhung from the rotor shaft of the driving motor; the cast-iron runner is carried on a steel stub shaft overhung from the flywheel shaft and enclosed in an aluminium alloy casing bolted to the rim of the impeller. The opposing faces of the impeller and runner are hollowed, the intervening space forming an elliptical annular chamber with a round central core, divided into cells by radial webs.

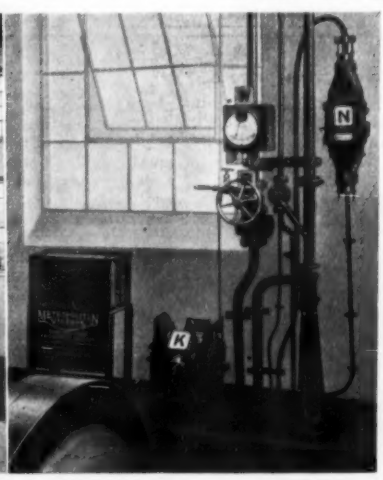
A stationary c.i. manifold, arranged concentrically with the stub shaft, is supported on the bedplate by brackets. From an overhead gravity tank, oil is delivered to this manifold, which communicates, through ports in the runner, with the annular chamber, whence it escapes into the casing. After passing through adjustable nozzles into an outer chamber, in which (attached rigidly to the manifold) is a stationary tubular scoop, the oil is discharged under pressure to the gravity tank.

When the speed of the flywheel is below that of the driving motor, the speed of the runner is correspondingly below that of the impeller, the difference representing the slip of the coupling. The oil in the impeller side of the annular chamber is subject to a greater centrifugal force than that in the runner side, and the body of oil in the chamber rotates about the central core. Since the oil is continually interchanged between the impeller and the runner, energy is transferred from the radial vanes in the impeller to those in the runner, and this continuous transference causes the coupling to transmit torque.

If the generator torque is greater than that transmitted by the coupling, the slip will increase and the runner and the flywheel will drop in speed, the flywheel supplying the surplus energy required by the generator.



Flywheel motor generator set and winder



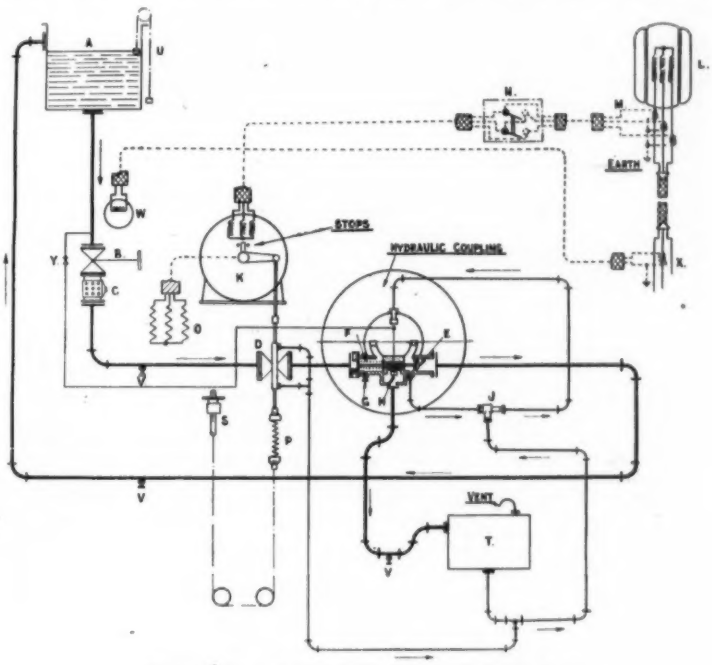

Controls for regulator; coupling in left foreground

By regulating the torque transmitted by the coupling, the load on the synchronous-induction motor may be limited to the average demand of the equipment, the torque fluctuations due to the momentary peak loads being equalised by the speed variations of the flywheel. If the torque transmitted exceeds that absorbed by the generator, the runner will increase in speed, decreasing the slip, the excess energy passing to the flywheel, the speed of which rises with that of the runner.

The energy transmitted by the coupling at any rate of slip is proportional to the mass of oil circulating in the annular chamber, and, by controlling the quantity of oil admitted, the torque transmitted may be continuously regulated.

### The Control System

The arrangement of the coupling control system is shown in the accompanying diagram. The oil supply is varied by the action of a valve, D, which is closed by the movement of a torque motor, K, energised from a series transformer, M, connected in the leads to the synchronous-induction motor, L, and acting against the tension of a calibrated spring, P. Immediately the current supply reaches a predetermined value, the pull exerted by the torque motor equals that exerted by the spring, and any tendency for the current to increase above this value causes the valve to start to close, so limiting the torque transmitted by the coupling and permitting the slip to increase. The valve is of a balanced piston type and, together with the torque motor, is almost frictionless and of very low inertia, so that the response to any change of load is extremely quick and the governing is within close limits.




**Arrangement of control system for slip regulator**

A gravity oil tank, B sluice valve, C filter, D oil governor valve, E automatic shut-off valve, F spring, G by-pass adjustment, H drain port, J ejector, K torque motor, L main synchronous induction motor, M series transformer, N torque motor switch, O torque motor resistance, P torque motor spring, R roller chain, S adjustment for spring, T drain tank, U oil level indicator, V drain cock, W horse-power meter, X current transformer, Y stop valve.

Thrower rings in the coupling prevent the escape of oil from the manifold, and the surplus drains by gravity to a sump tank, T, under the floor, from which an ejector, J, operated by the discharge pressure, returns it to the system. A valve, E, in the manifold closes the discharge pipe by the action of a light spring immediately the delivery ceases, in order to prevent oil from flowing back through the scoop tube when the set is stopped.

Mounted on the wall alongside the set is a sluice valve, B, arranged in the delivery pipe, by means of which the oil supply may be controlled when starting and shutting down. Adjacent to this is a pilot valve, Y, through which a small supply of oil is admitted to the thrust bearing between the impeller and runner to ensure lubrication when the main flow is shut off at the sluice valve. A filter, C, in the delivery pipe collects any foreign particles in the oil.

When starting, the synchronous-induction motor is first run up alone with the sluice valve shut and only the pilot valve open. Oil is then slowly admitted to the coupling through

(*Continued at foot of page* 668.)

# Beryllium

## A useful lightweight metal and its alloys

THE metal beryllium is new to industry; it has only been available on a commercial scale during the past two years. Apart from the alkali metals, it is the lightest of all metals, being one-third lighter than aluminium.

It is one of the extreme lower group of metals, between lithium and boron; its atomic number is 4, its specific gravity is 1.84 (0.065 lb. per cu. in.), its melting point is 2,336 deg. F., it is harder than glass, and has an extraordinary chemical affinity for oxygen.

Beryllium was first prepared in a pure state by Wholer in 1828. No method was known of producing it otherwise than in the form of flakes until 1921, when Stock and Goldschmidt made large pieces electrolytically by maintaining the temperature of the electrolyte above the melting point of the metal itself. The process has since been developed on a commercial scale by the Siemens & Halske Co., of Berlin.

Raw beryllia is found chiefly in North America; the deposits of the mineral are scarce and the yield low. Recovery demands a good deal of preliminary heating of the apparatus and the electrolyte, the electricity consumption is large and the crucibles soon wear out at the high temperatures involved. These facts explain why the price of beryllium is at present still somewhat high, although it has dropped quite considerably since industrial production started. The commercial product contains 98 per cent. beryllium and 1 per cent. iron, the remainder being dross; it is possible, however, to produce the metal in an almost pure state of 99.5 per cent. beryllium.

The pure metal is so brittle that it is difficult to work, but it can be pressed at red heat into thin plates of about 20 mm. in diameter and 1 to 2 mm. in thickness, which are being used as windows in protected X-ray tubes; X-rays penetrate it seventeen times better than aluminium, which was formerly used for such windows.

### Employment with Copper

So far the commercial product is being used almost exclusively for alloys. Owing to its affinity for oxygen, beryllium exerts a powerful reducing action and it is replacing phosphorus more and more for the reduction of cast copper. From the foundry point of view cast copper reduced with beryllium has the same excellent properties as when reduced with phosphorus, but has a still higher density and especially greater electrical conductivity.

While it is hardly possible in the case of a phosphorus casting to exceed a conductivity of 44 (that of electrolytic copper being 60), conductivity as high as 56 can, it is claimed, be attained with a copper casting that has been reduced with beryllium, which figure corresponds to that of rolled electrolytic copper. Thus the size of cast parts of electrical apparatus can be reduced by about 25 per cent., which means a great saving of material and a reduction of weight.

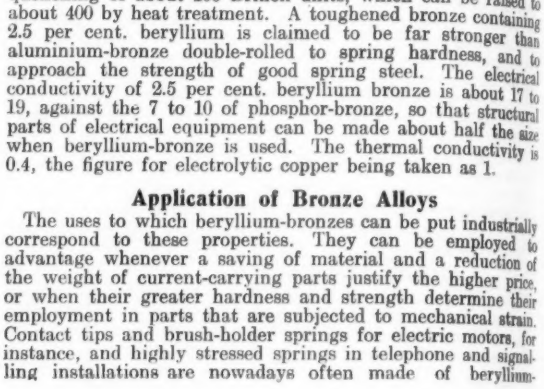
The most important beryllium alloys are those formed with copper, cobalt, and nickel. In all alloys employed for industrial purposes the beryllium content does not rise above 3 per cent., so that the high price of the metal does not stand in the way of their use. Such alloys can be converted by a process of quenching and tempering from their original soft condition into a spring-temper state which is valuable for technical purposes. This property of toughening is shown by bronzes with a beryllium content ranging between 1.3 and 5 per cent., being most marked with a beryllium content of from 2.4 to 3.5 per cent.

Beryllium-bronze, as distinguished from beryllium-copper, differs greatly in its physical properties from other bronzes, being superior to them. A bronze containing 2.5 per cent. beryllium, without heat treatment, has a hardness after quenching of about 100 Brinell units, which can be raised to about 400 by heat treatment. A toughened bronze containing 2.5 per cent. beryllium is claimed to be far stronger than aluminium-bronze double-rolled to spring hardness, and to approach the strength of good spring steel. The electrical conductivity of 2.5 per cent. beryllium bronze is about 17 to 19, against the 7 to 10 of phosphor-bronze, so that structural parts of electrical equipment can be made about half the size when beryllium-bronze is used. The thermal conductivity is 0.4, the figure for electrolytic copper being taken as 1.

### Application of Bronze Alloys

The uses to which beryllium-bronzes can be put industrially correspond to these properties. They can be employed to advantage whenever a saving of material and a reduction of the weight of current-carrying parts justify the higher price, or when their greater hardness and strength determine their employment in parts that are subjected to mechanical strain. Contact tips and brush-holder springs for electric motors, for instance, and highly stressed springs in telephone and signalling installations are nowadays often made of beryllium-bronze. Steel can profitably be replaced by the new metal alloy when there is danger of its rusting or it is desired to avoid magnetisation. The field of application of such bronzes cannot be even approximately delineated at present, as the properties of the material can be varied to an extraordinary extent according to the beryllium content of the alloy and the nature of its treatment.

*a*, graphite crucible; *b*, fused electrolyte; *c*, graphite block; *d*, steel container with small coal; *e*, cooling frame; *f*, crucible cooling water supply; *g*, outlet pipe; *h*, scrubbing liquid; *i*, exhauster; *k*, anode current supply; *l*, cooled cathode; *m*, cathode cooling water supply; *n*, movable cathode holder; *o*, cathode frame.



Electrolytic production of beryllium

The new metal is discussed at some length by Herr J. Becker in a recent issue of *Engineering Progress*, a monthly journal printed in English under the auspices of the three leading German electrical engineering and metallurgical associations.

## A Hydraulic Slip Regulator (*continued from page 667*)

the sluice valve, B, and the flywheel rotates. The load on the motor is indicated by an ammeter, W, calibrated in horse-power, mounted above the sluice valve. As soon as the flywheel is at full speed, the slip at this point being about 2 per cent., the sluice valve is fully opened, the pilot valve, Y, closed, and the torque motor switched on to its transformer. The set is then ready to operate the winder.

### The Winding Plant

The winder comprises a cylindrical drum 12 ft. in dia. by 4 ft. wide, increasing by $\frac{5}{16}$in. at one end to allow for an extra depth of 6in. at one of the shafts, each cage running in a separate shaft. The 370-h.p., 350-r.p.m. winder motor drives the drum through single-reduction double-helical gearing at 35.6 r.p.m. A face-plate controller, operated from the driver's lever through a quadrant and pinion, varies the generator excitation. The post-type brakes are applied by dead weight and controlled by an air engine. A Lilly controller driven by gearing from the drum shaft affords overwind and overspeed protection.

The designed output of the winder is 144 tons of coal per hour from 660 ft., the net load per wind being two tons. Short periods of stone winding are occasionally performed with a net load of 3.2 tons. Successive stone winds may withdraw energy from the flywheel at a higher rate than it can be restored; when a large amount of stone is to be raised at one time, the torque transmitted by the coupling must be increased so that the flywheel may return to speed after each wind. A handwheel, ES, operating a screw, increases the spring tension opposing the torque motor, and sets the regulation for operation at a higher average load than that used for coal winding.

The accuracy of the load equalisation is such that the maximum variation in load is only about 5 per cent. of the average load, although the output of the winder motor during each wind varies between 500 h.p. load and 150 h.p. regeneration.

The erection of the equipment was carried out by Messrs. Barber, Walker, without interrupting the normal working of the colliery, during the Christmas shut-down of the colliery. The mechanical parts of the new equipment were erected on the original foundations, using the original holding-down bolts. The new plant was ready for winding within 96 hours of the commencement of the work, and coal was raised uninterruptedly after the conclusion of the normal shut-down of one week.

The main contractor was the Metropolitan-Vickers Electrical Co., Ltd., which was responsible for the whole of the equipment. The mechanical portions of the winder were manufactured by Messrs. Fullerton, Hodgart & Barclay, and the hydraulic coupling by the Hydraulic Coupling & Engineering Co., Ltd. Eight similar equipments were installed in South Africa and Australia in 1931.

# MEETINGS AND DISCUSSIONS

## Current Topics and Opinions Expressed at the Institutions

### Progress in Decorative Lighting

IN the paper which he read on April 26th before the ILLUMINATING ENGINEERING SOCIETY, Mr. E. H. Penwarden states that it may conceivably be a matter of opinion whether certain developments that have taken place in recent years in decorative electrical illumination can be considered "progressive" from an artistic point of view, but there can be no dispute regarding the progress in design and efficiency.

In the very latest systems the lighting equipment is so much an actual part of the architectural scheme that it can be no longer grafted on to it as an afterthought—a site must be provided for the equipment at an early stage in the design, and its exact nature must then be determined.

#### Convention and "Atmosphere"

The tendency to adhere rigidly to conventional forms, more or less reproductions of the actual lighting units originally used, is being challenged by many designers. It is contended by some that such reproductions are necessary to retain the atmosphere of the period, but if this applies to such an indispensable adjunct as artificial illumination, should it not also apply to the occupant of the room? Immediately a person enters the room in modern dress, is not this so-called "atmosphere" destroyed?

The vertical line effect has a distinct appeal, and numbers of striplite lamps have been installed on the Continent, but experts there are discontinuing the application of such units on a large scale, owing to the difficulty and cost of maintenance. The necessity for providing a wireway at each end causes serious limitations, but tubular lamps of similar character, with a single-ended b.c. attachment, appear to have overcome the difficulty.

#### The Predominance of Glass

The most pronounced development in practice in recent years, as applied to individual lighting units, is the extensive use of glass as a combined light-diffusing medium and decorative *motif*. In conjunction with this innovation the simplification, and in some cases almost complete elimination, of visible metalwork is a very marked feature of modern design, and is a complete reversal of the ideas which prevailed until a few years ago.

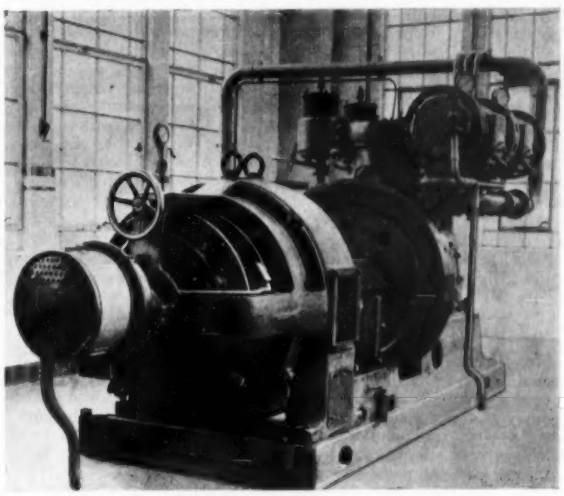
Although we are still dependent on Continental manufacturers for certain kinds of decorative glass, British manufacturers are now making many patterns of standard rolled glass in varying tints and with excellent diffusing properties. The nature of the glass itself is a dominating factor and decorative types reveal surprising differences in behaviour when actually put to the test.

#### An Important Distinction

It is of the greatest importance to distinguish the difference between "luminous decoration" and "decorative illumination." The former is that which not only produces the desired decorative effect, but also provides adequate illumination. The distinction is often overlooked by architects and designers of decorative schemes.

The hard-headed business man is asking "How long will it last?" There can be no doubt that the greater availability and reduced cost of electricity and lamps will create an increasing demand for decorative lighting.

Which particular design or method will prevail? One very important consideration which will have a pronounced influence on this subject is maintenance. This applies equally to the design of individual units and built-in lighting. In large public buildings where there is a maintenance staff the problem is not so acute, but what of the smaller buildings and private houses? Take, for instance, the somewhat fragile construction necessary for the assembly of many panel-glass units and the corresponding difficulty and risk of breakage in dissembling the glass for cleaning. The modern housemaid will have to take a course of instruction on this subject if she is to claim efficiency.



**A Supply Exchange Scheme** (*see p.* 660).
**Air compressor driven by a variable-speed a.c. commutator motor**

### The G.I.P. Electrification Discussed

AT a joint meeting of the INSTITUTION OF ELECTRICAL ENGINEERS and the INSTITUTE OF TRANSPORT on April 28th, Mr. F. Lydall's paper on the electrification of the suburban and certain main-line sections of the Great Indian Peninsula Railway (which was reviewed in our last issue) was read and discussed.

Mr. Frank Pick (president of the Institute of Transport) opened the discussion by remarking that railway electrification must engage attention more and more in the near future. The work described in the paper had developed from a modest scheme for dealing with suburban traffic. The Southern Railway had gone ahead on much the same lines, and the lesson to be learned from both schemes was that once electrification was started all was well. The difficulty was to get it started.

The real troubles of the electrical engineer began when he came to discuss the matter with his lay colleagues, and for that reason alone it seemed that it would be necessary for the Institution of Electrical Engineers and the Institute of Transport to work together as closely as possible. The problem was one which would have to be solved, and the earlier they started to discuss it the better. It was to be hoped that the paper would encourage this country to go ahead a little more quickly.

Lieut.-Col. F. A. Cortez-Leigh asked for further information concerning the passenger locomotives. Did the double contact wire system require more maintenance than the single-wire system, and in this way lose its advantage from the point of view of current collection? He also asked about the effect of the salt atmosphere in India in relation to corrosion, and whether the concrete bases of the overhead structures had disintegrated through current leakages.

The cost per mile of single track (£4,700) seemed to be high as were also the prices given for sub-stations (£68,000), although no doubt transportation costs had their effect as compared with this country.

#### Governmental Courage

Sir Clement Hindley, who had a close personal acquaintance with the origin of this scheme when he was in India, expressed pleasure at the completion of the work and the fact that the estimates had proved reasonably accurate. To decide upon an expenditure of 5¼ millions sterling on railway electrification required courage on the part of the Indian Government; the great difficulty was with the financial people. However, in India the engineers seemed to get their way more easily than they did in such matters at home.

His own view of the Southern Railway electrification was that it was suburban. It was not really a main-line scheme as ordinarily understood, and therefore he claimed that the scheme described in the paper was the first real main-line electrification in the Empire.

Although the traffic on the electrified G.I.P. lines had not yet reached the estimate forecast, the return was sufficient to pay 6¼ per cent. on the capital outlay. If Mr. Pick required any encouragement he would surely find it in this scheme.

#### Maintenance and Failures

Lieut.-Col. H. E. O'Brien suggested that there had been a sufficient period of operation to enable one to judge, from the maintenance costs, whether the figure of 6¼ per cent. would be increased or diminished. He expressed surprise at the number of armature failures and he also could not understand why there should have been so many gear failures because on the Bombay-Baroda Railway the gears had worked absolutely satisfactorily.

While 171 steam locomotives had been replaced by 65 electric locomotives, the mileage per electric locomotive of about 60,000 per annum was not a very wonderful figure; the Swiss locomotives ran greater mileages.

One of the things electrical engineers always forecast with electrical working was a reduction of repairs and the final test was the cost per engine mile. So far as could be judged from the figures in the paper, the result was on the high side and he asked whether inspection had not been over-done in the desire to secure an absolutely satisfactory result; thus the cost might have been made unnecessarily high.

It should now be possible to produce electric locomotives which would run very long distances with practically no inspection at all, just as the automatic sub-station was expected to operate for long periods without any attention. The cost of electric traction was capable of being brought down by having only one man on each electric locomotive.

### The Financiers' View

Mr. H. W. H. Richards expressed the view that the decision to use 1,500 V as the line voltage in India was extremely sound, because by the adoption of that standard it would be possible considerably to reduce locomotive inspection in future. Moreover, the adoption of a voltage that could be used for both main and suburban lines would be appreciated by those in charge.

Those responsible for the management of railways here were too much inclined to think only of the actual financial aspect, and they overlooked the value of selling a more useful article to the public in influencing the ultimate financial return.

Mr. Bruce G. White, who spoke of experience in India both before and after this electrification scheme had been carried out, paid a tribute to the consulting engineers and the British manufacturers, but he asked for some justification of the erection of a steam power station. The conditions in the Ghats were very similar to those in Switzerland and he should have thought the greatest efficiency would have resulted from the use of water power.

He expressed some surprise that the costing of the scheme, after a period of five years, was not yet available in greater detail. The reduction of operating costs was what people were looking for. This was more likely to be brought about by steady progressive development of electric traction than by wholesale expenditure of the kind recommended in the Weir report.

Mr. E. H. Croft discussed a number of detailed points concerning the locomotives, suggesting that articulation was wrong, and the author briefly replied to the questions raised by the speakers.

## Will Welding Displace Riveting?

AT an informal meeting of the INSTITUTION OF CIVIL ENGINEERS on April 20th, Mr. F. R. Freeman opened a discussion by referring to the growing adoption of electric welding in place of riveting, and to the various bodies, including the Board of Industrial Research, that were attempting to draw up a code of practice. The advantages of the method were stated to be economy, improved construction, convenience, avoidance of noise during erection, and appearance. The disadvantages were unfamiliar construction, lack of complete test data, heat contraction stresses, lack of experienced welders and lack of standardised practice in design and materials, but, in the introducer's opinion, these would all be overcome as greater experience was obtained. Lantern slides indicated the progress that was being made, both at home and abroad.

Sir Clement Hindley paid a tribute to the courage of those embarking upon welding while the data were still somewhat scanty. He pointed out that the stress analysis of the rigid joints effected by welding would have to be considered.

### The Question of Economy

Mr. Bullock questioned whether any economy would be obtained beyond that due to better design. Welding would be a benefit to small firms, owing to the small plant required. The rigidity claimed might not be so great as anticipated, in comparison with riveted work, as, in the latter case, the material in the covers added rigidity. In welding, the unknown temperature stresses were likely to produce distortion.

The introducer replied that, in addition to economy of material, there was economy of workmanship. Temperature stresses existed, but were ignored in riveted work; in welded work, by careful arrangement, they could be reduced to small intensity. No field test had yet been arrived at, but he did not think that one was necessary. Welds made by skilled operators, with proper electrodes, at correct currents and under good inspection, should yield consistent results, and tests to date justified this confidence.

### Reliability

Professor Haigh referred to various test results. Fatigue tests of welded joints containing slight slag inclusions showed that the strength, although greatly lowered, was not reduced further than that of mild steel when injured by small holes, or nicked, such as would often occur in practice.

Mr. Brough mentioned some of the strengthening work for which he had been responsible under Mr. Miller, of the L. and N.E. Railway, where economies of from 50 to 80 per cent. had been obtained in comparison with what it would have cost to do them by riveting. He was of the opinion that high local temperature stresses occurred at and near the weld, but did not think they really mattered, owing to the factor of safety. He preferred fillets to butt ends.

Mr. Roberts showed some lantern slides of the joints being adopted in connection with a five-span bridge on the approach to the Tees vertical lift bridge now under construction, and explained the precautions being adopted for large butt welds.

Mr. Hurst pointed out the difficulty of inspection of site welds on a large building, to which the introducer replied that inspection was no more difficult than for reinforced-concrete work. The only danger was from slag inclusions, which were not likely to affect the strength to more than about 1 per cent. under proper working conditions. In the long run one must rely upon the integrity of the workmen and of the firms carrying out the work, and reasonable inspection during the course of the work.

## Underground Railway Signalling

MODERN automatic signalling as used on the Underground electric railways of London is the subject of a paper which Mr. P. W. Ottley read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS last week.

Part I explains the fundamental principles and Part II describes the type of gear now being installed on sections of the railways which are being extended.

A fuse and transformer set is used for stepping down from the supply voltage of 650 to the apparatus voltage of 100 or 150. Separate windings feed the track circuits and signal lighting. Paper condensers variable in steps of 1 $\mu$F are used for energising the track circuits. A total capacitance of 20 $\mu$F is sufficient in dry situations, but up to 60 $\mu$F is required in the open air.

The track relays are vane-type with two separate energising windings, one of which produces eddy currents in the vane which react on the field produced by the other winding, thus producing the torque. The contacts are (moving) silver and (fixed) carbon, this combination being found to be the best. The relay is fitted with a removable top which enables the relay to be changed without disconnecting any wires. Relays are sealed and are not adjusted on the track.

The signal relays are similar to the track relay, but have only one winding. The principle of operation is that of the shielded pole. The train-stop device consists of an arm held in a vertical position at the side of the track by means of a steel spring in compression. The arm is lowered by means of compressed air at 60 lb. per sq. in., which is admitted to a cylinder through an electro-pneumatic air valve energised through the signal relay.

In tube sections a small signal is used with a lens diameter of 4½ in. The source of illumination is two lamps in parallel, one working at its correct voltage and the other under-run some 20 per cent. This has the effect of dimming the signal due to failure of one lamp before total failure occurs. Both lamps are renewed together. On outdoor sections a much larger type of signal is used, which has a lens diameter of 8 in., and is lit by means of a double-filament lamp energised through a small step-down transformer. One filament is under-run so as to give the same effect as in the other method described.

## A Potent Cause of Oil Engine Troubles

WHEN discussing heavy-oil engines it is becoming difficult to avoid reference to cylinder liner wear, for it is said to account for over 20 per cent. of the cost of replacements.

One is told that excessive wear is due to ash, improper lubrication, pressure of piston rings, stuck, broken, or improperly fitted rings, poor or unsuitable material of which rings and liners are made, incomplete combustion, gas washing, side tilt of the piston, dust in the air, sulphur in the fuel, &c.

But the fact remains that, although there may be those who consider they know why liners wear, no one has been successful over a long period in avoiding wear. Wear is by no means universal, and may vary between different cylinders on the same engine. The greatest wear is almost invariably at the combustion end of the liner. Exhaust valve troubles and excessive liner wear are often closely connected.

In the paper which Eng. Rear-Admiral J. Hope Harrison read on April 28th before the DIESEL ENGINE USERS' ASSOCIATION, an attempt is made to collect information concerning liner wear and to examine some theories that have been propounded to explain the cause. An endeavour is made to indicate the lines along which research should proceed in order that the cause may be ascertained and the best means of preventing it discovered.

## Safety in the Home

ONE is apt to think that the roads constitute the only danger to life and limb, yet the annual death roll in Great Britain from accidents in the home and everyday pursuits is nearly equal to that from traffic accidents, and more than double that in industry. If over 75 per cent. of street and factory accidents are due to some failure of the human element (which is the contention of the National "Safety First" Association), then at least the same proportion of home accidents is similarly due to lack of thought or care.

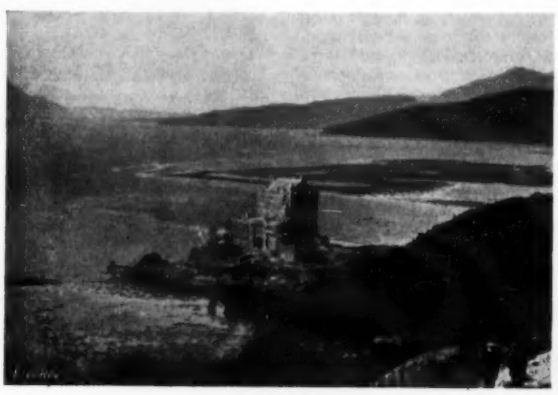
In order to arouse the interest of women all over the country in the subject, the National "Safety First" Association is devoting a session during its annual Congress (May 4th to 7th) to the study of safety in the home, when the following will speak: Mrs. St. Aubyn, Dr. Elizabeth Sloan Chesser, Miss C. Haslett, director of the Electrical Association for Women, and Miss N. March. The President of the Association, Lord Brentford, will open the session, and Miss Margaret Bondfield hopes to preside. There will be a visit to the works of Messrs. Peek, Frean & Co., as a practical demonstration of safety organisation in a factory.

# An Ancient Scottish Keep Electrified

## A self-contained installation

THE ancient Eilean Donan Castle is built on a small islet in Kintail parish, Ross-shire, at the junction of Loch Long, Loch Duich, and Loch Alsh. It is accessible from the mainland at low tide, but surrounded by water to the depth of eighteen feet at high tide. The Castle is said to have been given in the year 1266 to Colin Fitzgerald, son of the Earl of Desmond, and since then has had a very interesting history.

It has recently been restored by the Macrae of Conchra, "Constable of the Tower," and is one of the largest keeps in the country. The restoration involved the reconstruction, above the great banqueting hall, of the masonry work generally, and the formation thereon of two bedroom floors, the lower one comprising the State bedrooms and dressing rooms, and the upper a number of subsidiary bedrooms. The windows of these open on to battlements around which there is ample room to walk within the crenelated outer walls. Like many of the old keeps, the lower part of the structure consisted of crypts, which were opened up during the restoration and have been converted into a billiards room, &c.



Eilean Donan Castle

The main banqueting hall is above this, and occupies virtually the whole of that floor, though within the thickness of the walls there are various apartments, including the private room of the "Constable of the Tower," the ladies' withdrawing room, and the pipers' gallery. Staircases for the most part are also within the thickness of the walls, though one wheel staircase at a corner is partly outside the main walls.

The structure of the ancient edifice consists mainly of water-worn boulders of whinstone, largely gathered from the shore. It was found impossible to use metallic sheathed cables, as the use of plaster in covering the face of the natural walls was unthinkable. It was therefore decided to run steel tubes boldly down the face of the walls, using the surface type of switch and plug controls and colouring the tubes to harmonise with the background.

Henley cables were used for the whole of the installation, which was carried out by Mr. B. A. Pilkington, of Edinburgh. It comprises something over a hundred lights, and the peculiar nature of the building necessitated the use of about fifty two-way switches. The supply of electricity is brought by way of the kitchen offices, which are situated some distance from the keep, and adjoining the portcullis which has been restored to its original functions. The plant is housed in a chamber situated in the outer walls overlooking the sea, and within the walls of apartments which were used in connection with the 17th century kitchen.

The electrical plant comprises a low-speed horizontal Ruston-Hornsby engine using paraffin as a fuel and having an output of 7½ h.p., as it was deemed necessary to have machines of the utmost simplicity in a place so remote from an industrial centre. The electricity is stored in a battery of such size that the castle can be supplied with ample light by its being charged up twice a week. From the power house to the distribution gear situated near the portcullis, current is carried through an underground Henley paper-insulated cable, the track for this having been cut through the rock.

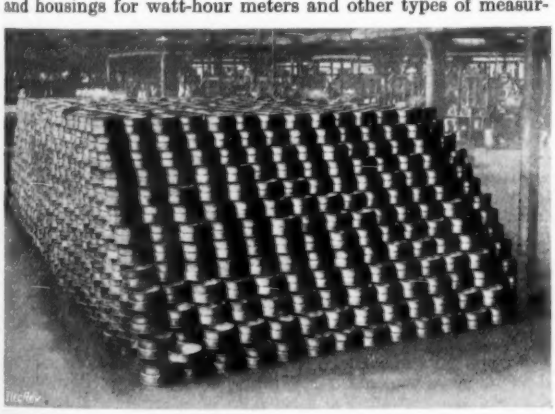
The present owner is Lieut.-Colonel John MacRae-Gilstrap, of Eilean Donan. The architect responsible for the reconstruction was Mr. George M. Watson, of Edinburgh, who is a distinguished authority on ancient Scottish architecture, of which this keep is an excellent example.

# Aluminium in the Electrical Industry

## Light and rustproof

ALUMINIUM is a metal of a thousand uses and it is employed throughout the electrical industry in manifold ways. Sixty years ago the metal cost 4s. an ounce, forty years ago it was 2s. a pound, and to-day a far more highly refined and purer metal sells for less than half that price.

Among its most interesting applications is that of casings and housings for watt-hour meters and other types of measuring instruments. Aluminium, being non-magnetic and having a high conductivity, forms an effective electrostatic shield.



Ten thousand table cooker stampings

These properties are still more fully developed in shields and screens for wireless apparatus. The interior of the best receiving sets is already little more than a group of closed aluminium receptacles mounted between aluminium partitions on an aluminium base.

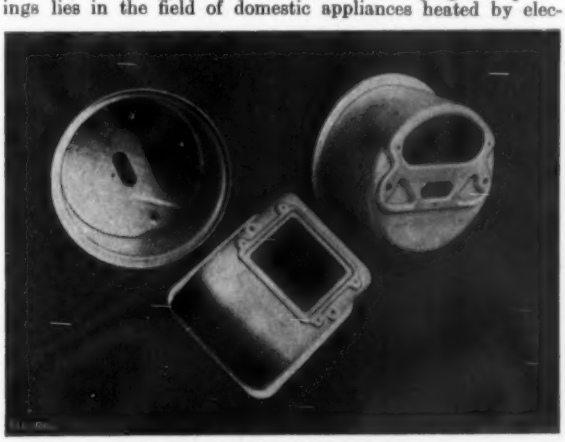
By means of the anodising process, whereby an electric current is passed from a cathode through a solution of dilute chromic acid to an aluminium article which acts as an anode, some beautiful finishes are given to the metal.

The effect of this electro-chemical action is to thicken up the natural coating of aluminium oxide which is always present on the surface of aluminium articles and to compact that natural coating into a hard film which is usually of a pearl grey finish. Furniture is already being made of aluminium, and then grained to imitate wooden furniture, so that aluminium wireless cabinets can be made in the same way.

Many electrical fittings hitherto made of other metal are now being made of aluminium, "Londal," or other alloys. There is, of course, a great saving in weight when aluminium fittings are used, and as aluminium resists atmospheric conditions admirably, there is a saving in time and labour, for less cleaning is required.

Aluminium reflectors for lighting are effective and low in cost. They cannot rust or chip and retain their polish for a long time, after which they can easily be repolished.

A very useful application of aluminium stampings and pressings lies in the field of domestic appliances heated by electricity. There are electric kettles, coffee percolators, and saucepans, as well as bodies and housings for electric cookers, grills, and toasters. Even the flat iron can be cased in aluminium. There are also special fittings for electric hair-waving apparatus, electro-therapeutic devices, and reflectors for ultra-violet ray treatment, and fan blades of aluminium reduce the load on the motor. The illustrations show articles supplied by the London Aluminium Co., Ltd.—C.H.L.



Pressed aluminium meter cases

# A Thermal-Insulation Works

## Extensive use of electricity

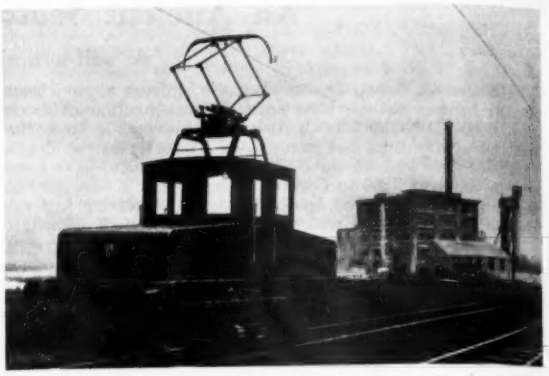
ONE of the most important establishments engaged in the manufacture of heat-insulating materials is the recently erected works of the Chemical and Insulating Co., Ltd., at Darlington.

The output of the factories includes 85 per cent. magnesia coverings as used for steam pipes, boilers, and the insulation of any heated surfaces; also high-temperature coverings, now essential in power stations in industrial undertakings where temperatures exceeding 600° C. are dealt with. The company manufactures Darlington "Dextramite" high-temperature covering, which will withstand temperatures up to 1,600° C., and a "Dextramite" insulating brick, which is largely used by furnace builders and iron and steel companies for the insulation of blast furnaces, coke ovens, and similar plant.

Another range of manufacture is the production of carbonate of magnesia and calcined magnesia for pharmaceutical and industrial purposes; rubber and tyre manufacturers make considerable use of both these materials.

In the preparation of the material a number of processes are involved, such as burning, crushing, hydrating, pumping, drying, &c.; supplies of compressed air and gas are required, and extensive use is made of electric power. An important part of the contract for the electrification scheme was placed with the General Electric Co., Ltd., for main and auxiliary switchboards, motors and motor control gear, and the equipment for an electric locomotive employed for yard shunting purposes.

The power supply is taken from the Darlington Corporation 6,000-V mains and transformed to 400 V. Distribution to the works is controlled by a switchboard consisting of six slate panels, of which four control power feeder circuits, one controls lighting feeder circuits, while on the remaining panel is mounted a power factor meter. Each of the feeder circuits is equipped with a three-phase oil circuit-breaker with overload trips, isolating links, ammeter, &c.



**The works and the electric locomotive**

A large number of electric motors drive the various appliances, the most important of which are those coupled to the air compressors, gas compressors, and drying fans. Two Belliss and Morcom two-crank two-stage units are each capable of compressing 625 cu. ft. of free air per minute, delivery being at 60 lb. per sq. in. Each compressor is driven by a 105-h.p. "Witton" synchronous induction motor, 440 V, three-phase, 50 cycles, 333 r.p.m., operating at 0.9 leading power factor.

The motors are controlled by liquid starters operated from two steel plate cubicles equipped with oil circuit-breakers with two overload trips and no-volt coil, and a moving-iron ammeter. The regulators for the exciters are electrically interlocked with the liquid starters.

There are, in addition, two Belliss and Morcom two-crank two-stage gas compressors, each capable of compressing 415 ft. of carbon-dioxide per minute. The delivery pressure is 60 lb. per sq. in. For driving these units 70-h.p. three-phase slip-ring induction motors are employed. They are controlled by standard oil-immersed rotor starter panels, including frame mounting pattern oil circuit-breakers with two overload trips, time lags, and no-volt coil electrically interlocked with the rotor starter. The G.E.C. supplied cables, ironclad distribution boards, conduit, lighting fittings, and many other accessories. The wiring was carried out by Messrs. Falconar, Cross and Co., Ltd.

An electric locomotive fed from an overhead line hauls trucks between the point where the railway company hands them over and the works. It is of the double-axle type and weighs 17 tons complete. It has a central driving cab and two end structures in which the control and auxiliary apparatus are accommodated. Power is supplied from the overhead line at 500 V d.c., and is collected by a spring-operated pantograph, which enables the locomotive to travel in either direction without provision for adjustment. It is equipped with two 500-V motors, each rated at 50 h.p. on the one-hour rating, and a series-parallel hand-operated controller with rheostatic braking for emergency use, while a handwheel type mechanical brake is provided for ordinary use.

**Compressor equipment**

# The Future of the Glasgow Subway

THE Glasgow Transport Committee has prepared a report for the Council, which, it is understood, will recommend electrification of the Glasgow Subway Railway. A saving of from £20,000 to £30,000 in operating costs per annum is anticipated.

The Subway was constructed in 1891-93 by private enterprise, but was taken over by the City Corporation under a Provisional Order in 1923, the order including also the purchase of the Paisley municipal tramway system which enabled the Glasgow city trams to run to Renfrew Ferry and also to the western borders of Paisley.

The railway is some six and a half miles long. It forms roughly a circle and serves the western portions of the city, crossing under the Clyde twice, at Custom House Quay and between Govan and Partick. In the streets, "cut and cover" methods of construction with lined brick or concrete were adopted. Blasting through rock had to be done at Cowcaddens Street. The Clyde Trustees insisted on the top of the tunnels being at least 10 ft. below the river bed. The tubes are cylindrical, 11 ft. in diameter, and run from 2 ft. 6 in. to 6 ft. apart.

The gauge of the existing railway is 4 ft., the original rails being T or flat-bottomed, 60.5 lb. per yard, spiked to creosoted sleepers, 9 in. by 4½ in., laid in whinstone ballast. The cars in use are 40 ft. 9 in. long, 7 ft. 6 in. wide overall, with a passage-way width between the seats, which run along the sides of the cars, of 3 ft. 7¼ in. clear. The cars have a seating capacity for forty-two.

At present the railway is worked by haulage cables, driven by engines installed in a power house situated in Scotland Street.

Electricity is used for lighting the tunnels and stations, operating a hoist at Kelvin Bridge Station, signalling, and for driving drainage pumps. The power is obtained from four sets of Belliss and Morcoms 120 h.p. compound engines coupled direct to 80-kW d.c. generators. The gradients are comparatively easy, the steepest being 1 in 20 to 1 in 23. There are fifteen stations on the line. The sharpest curve has a radius of ten chains.

Owing to the keen competition of the Corporation trams and buses, the cable subway has been running at a considerable loss for years; the stations and approaches are dingy and uninviting; the tube walls are not waterproof throughout; and the cars are none too comfortable. The first cost was only £1,100,000, exclusive of properties and lands which the company had to acquire. Electrification would appear to be the only alternative to shutting the railway down altogether, but the whole system requires overhauling from a constructional point of view before a scheme of electrification can be safely applied.

# Correspondence

*Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession*

## The Wholesalers' Reunion

The differences of opinion, involving certain policies, which caused several large wholesale distributors to secede from the E.W.F. in 1928, and to found another body known as the Electrical Merchants' and Manufacturers' Association, Ltd. (E.M.M.A.), having by the effluxion of time and other reasons mainly disappeared, negotiations have for some time been proceeding with a view to merging these interests.

The trading policy of both Associations has always been substantially the same, and the Councils of both feel that it is better to have only one body representing, and speaking for, the wholesale distribution side of the electrical industry.

The E.W.F., being the older Association, with the larger membership, it has been agreed that as and from May 2nd members of the E.M.M.A. will again become members of the E.W.F., and in due course the necessary steps will be taken to dissolve E.M.M.A.

The E.W.F. was founded in 1914, and will now have a membership of seventy-four. All the members of E.M.M.A. were originally members of the E.W.F., and three were founding members. The merger is, therefore, a source of particular satisfaction to both bodies, and will undoubtedly be greatly appreciated by the electrical industry as a whole.

The following are the members of E.M.M.A.:—Berry's Electric (1928), Ltd.; Downes & Davies; Drake & Gorham Wholesale, Ltd.; Wm. McGeoch & Co., Ltd.; the Sloan Electrical Co., Ltd.; the Sun Electrical Co., Ltd.; and the Wholesale Fittings Co., Ltd.

J. W. DADDS,
President, *Electrical Wholesalers' Federation.*

London, E.C.1, *May 2nd*, 1932.

[We have also received a letter in identical terms from Mr. A. G. Beaver, chairman of E.M.M.A.—EDS. ELEC. REV.]

## A South American Inquiry

We have an inquiry for an instrument capable of finding faults in underground telephone circuits. The instrument must be capable of giving the distance of the fault, preferably in metres, and the nature of the damage. Also we have two inquiries for a similar type of instrument for overhead telephone lines.

We shall be glad if you will put us in touch with the manufacturers of this equipment and ask them to send us their export discount price list by air mail from New York.

Also we would like to receive prices on five kilometres of 3 in. and five kilometres of 4 in. conduit pipe for telephone cables, complete with inspection boxes and covers suitable for street installation. The pipe may be of metal or other material, bearing in mind that price is a big factor in securing this business. The inspection boxes should be placed at the maximum distance that will permit the cable to be threaded through easily. These prices are also required by air mail from New York.

B. RICHARDS,
Apartado Aereo No. 43,
La Compania, Anco.

Bucaramanga,
Columbia, S. America.
*April 12th*, 1932.

## High-voltage Sub-station Insulators

Replying briefly to Mr. Andersen's remarks in last week's issue of the REVIEW, I may say that I am not aware that I made the fantastic statement that insulator records are futile, but I did suggest that it is quite futile to talk of records of service where evolutionary designs are concerned. This applies not only to insulators, but to bridges, battleships, and babycars. It should be obvious to anyone that if we were to wait for records of service we should get nowhere at all.

The theory of probabilities is by no means novel to me, but I am certainly surprised to learn that this theory—whatever it may be applied to—has nothing to do with philosophy! I am sorry that Mr. Andersen should find it so very tiresome to read the reiterated claims that cementless insulators are better than cemented ones. But at the risk of boring him still further I can only remark that in *modern* porcelain insulator manufacture one can dispense entirely with internal cement, and good riddance, too!

M. W. SINGER.

Manchester, *April 29th*, 1932.

## A Good Job!

I read with interest Mr. Abrahams' jovial sarcasm under the above heading in to-day's REVIEW. Ten years of publicity work has taught me always to "read between the lines."

My impression of the notice is that it was so worded that only really practical men would apply, because where batteries are used for the supply the period of recharging is often on alternate days. Where the load is a power load, or the batteries are working at full capacity, three or four hours a day should maintain them at full charge. Now if this is the case it will still leave four or five hours of the usual eight-hour day available for other matters.

Readers will have seen other advertisements in the REVIEW where the wording is so arranged that the appointment to be made is ostensibly an open competition of qualifications, and yet actually the matter is pre-arranged. To illustrate my idea I shall describe a little drama, in Mid Wales, which took place last Monday evening. Nearly two years ago a notice in the REVIEW invited applications for the position of electrical engineer and manager in a certain town. There was nothing further published.

Then in March of this year the same invitation turned up again. On inquiry I found that there were about 250 applications, so that it is certain that that notice had been seen in the REVIEW in many places. Yet when the short list was published three of the selected six were of the town and the other three from the district. Last Monday on final selection one of the former three was appointed.

BERNARD A. CRONIN.

Roath, Cardiff, *April 29th*, 1932.

**A Supply Exchange Scheme** (*see p.* 660). **Left: Weir turbine feed pumps (70,000 lb. per hour). Right: Boiler "down" for repair; fifty-six grate bars with 234 links per bar**

## Is the National Register a Failure?

If Mr. Falshaw devoted his energies to his particular area, he would, I am sure, find ample scope for obtaining recruits for the National Register, for in Harrogate, as in other areas, there are any amount of would-be electrical engineers.

I can recall an individual who is a spare-time electrical contractor. During his daily round he fixes meters, reads meters, drives a van, repairs and washes it, does wiring work, looks after electrical appliances, does cable-jointing, &c., in fact, is a Jack-of-all-trades. Individuals of this type are a menace to reputable electrical contractors and craftsmen alike. Even if all contractors were members of the National Register, individuals of this class could not be eliminated.

So long as a cut-throat policy is pursued even by members of the Register, Mr. Falshaw is in much the same position as the craftsman. Corporations or public supply companies are unlikely to be of much assistance though they put up ornate books of wiring rules. They need to take the mote out of their own eye, for they employ in some areas I have in mind promoted navvies to do their cable-laying, mains connections, substation work, &c.

Hence reputable contractors are as much at a discount as trained tradesmen. As one of the latter I can appreciate Mr. Falshaw's point of view, for I meet the same troubles in my calling—the promoted labourer, amateur wireless hand, picture frame maker, &c., who turn out cheap and nasty work with only a hazy notion of what they are doing.

The attitude adopted is that it's all right so long as it

works; how it is done does not matter, cheapness being the primary point. The layman does not know and a happy hunting ground is provided for the "chancer." I, too, would be glad to learn how to eliminate the "illegitimate" contractor for the reasons which I have stated. TRUDGE.

*May 2nd*, 1932.

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I have read Mr. Falshaw's letter on this subject in the current issue of the ELECTRICAL REVIEW with some interest.

Does the Register really want members; if so the eligibility of a person to become a member should be his capability and not his worldly position. I applied for registration and was refused after the Committee had deliberated about six months, being informed after I questioned their ruling that I had not been in business long enough.

As a matter of fact I have been in business for about seven years as an ironmonger and electrical engineer, opening in a new district and carrying a stock valued between £800 and £1,000.

I may say that I had full charge of the night shift at the Austin Motor Co. during the war, was refused admission into the Army owing to my position, and joined under the Derby Scheme. I was for five years branch manager and inspecting engineer for the Hart Accumulator Co., Ltd., here in Birmingham after I left the Austin Co. I enclose a number of references which prove my statements. T. A. HOLT.

Hall Green, Birmingham.

*April 29th*, 1932.

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Mr. R. Falshaw, in his letter published in your current issue, undoubtedly hits the nail on the head when he calls for compulsory registration. Were this put into force a rush would certainly take place for enrolment, but as matters stand at present how many would be nominated? I have no hesitation in saying that not 20 per cent. would be elected, for the simple reason that many of the so-called "electrical engineers" are persons wholly without experience.

This extraordinary position has, I suggest, originated with the introduction of wireless components. In the early days of radio the electrical trade for some obscure reason seemed loth to take up this lucrative side line, with the result that sweet shops, wardrobe dealers, and chemists and an incredible array of other trades commenced to sell components to the public.

There are still with us people dealing in radio—I use the word "dealing" in its strict sense—who, only too happy to sell a set, are on their beam ends when confronted with a technicality; these versatile few still further augment their turnover by supplying one with cigarettes, sailing ships, and sherbet; in other words, they stock a set or so, knowing the public will still unfortunately buy a most complicated mechanism from any Tom, Dick and Harry. The public are a fickle crowd, so we can hardly sympathise with them if they get bitten.

These versatile "dealers" having sold a set or two and repaired a bell, naturally put out a board inscribed "Electrical and Wireless Engineers."

Is not the trade itself to blame for this broadcasting of discounts? If such people as I have mentioned confined their efforts to their own trading, it would, as Mr. Falshaw aptly states, make trade less uneconomic for the legitimate engineer.

At the same time I feel that Mr. Falshaw is rather harsh in describing these dabblers as "illegitimate." I should be more inclined to use such an expression with reference to the man working from home, who can continually cut prices, having neither shop rates nor other overhead charges and who needs only to keep enough stock for his immediate needs.

I think that the National Register, collaborating with the various supply companies, could do much to effect more general registration. WILLIAM TASSELL.

Hull, *April 29th*, 1932.

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### A Lapse

On page 622 of the current issue of the ELECTRICAL REVIEW you ask your readers a question which we should like to answer. The question ". . . is price the only consideration nowadays?" is asked in a paragraph headed "A Lapse," in which a certain Corporation is pilloried for having placed an order for cables with a non-British firm which in this instance was our company.

The matter has at least two aspects, with only one of which the paragraph in question deals. Another is the fact that our company regularly and continuously places orders with British firms in Great Britain for a large variety of materials, apparatus, machine tools, and other goods. The extent of this business may be judged from the fact that during the two years 1930 and 1931 the total value of orders we placed in Great Britain amounted to the sum of £261,091 (a monthly average of £10,879), as has already appeared prominently in your advertisement pages.

British firms are desirous of extending their export trade in Belgium and other countries, but we doubt if their efforts are likely to be assisted when a Corporation or other purchaser who ventures to place a relatively small order abroad is held up to opprobrium in the editorial columns of the ELECTRICAL REVIEW.

We feel sure that in your anxiety to be fair you will gladly insert this letter in the next issue of your paper.

A. C. E. C.
John H. Bunting, *British Manager*.

London, S.W.1, *May 3rd*, 1932.

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### Hybrid Cookers

We fear that Mr. F. Risch, in his letter published in your April 22nd issue, is under a misapprehension with respect to what we put forward regarding the gas boiling ring. No question was raised as to its efficiency or tendency to blow out whilst boiling.

While we agree that the heat can be minutely regulated, yet this is only possible over a certain range with safety; this range does not extend to a point low enough for the best results in simmering. In the case of electricity, there is practically no such limit, the heat for simmering may be quite a small fraction of that used for boiling.

London, S.E.1, *April 26th*, 1932. WILLIAM GEIPEL, LTD.

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## Electrical Schemes in Egypt

ELECTRICAL development schemes in Egypt are progressing rapidly. In North Delta, the Seru power station is now running satisfactorily, and it is hoped that the Aff power station, equipped by the English Electric Co., Ltd., will be opened next August. At the Belquas power station the building is completed and the machinery is in course of erection.

Fifteen sub-stations constructed by the Metropolitan-Vickers Electrical Co., Ltd., will have been erected at the end of the current year, and transmission lines, constructed by Siemens Brothers, Ltd., are well advanced.

**The l.p. portion of the turbine stator about to be placed in position at the Edfu power station**

The Isolated Basins Scheme is also nearly completed, and the power station at Edfu is now in course of construction. It consists of two Brown Boveri 3,150-kW, impulse-reaction, two-cylinder, 3,000 r.p.m. turbo-alternators. The steam conditions are 30 kg. per sq. cm., and 350 deg. C.; the normal vacuum gauge pressure is 710 mm. The coal consumption will be 0.605 kg. per kWh, and the steam consumption 4.9 kg. per kWh.

The alternators are of the rotating field, three-phase, 50 cycles, 3.3-kV totally enclosed air-cooled self-ventilated type. Each alternator develops 2,500 kW at 0.8 power factor, the poles of the alternators being of the salient type, and four in number. The alternator's efficiency is about 96 per cent. at unity p.f. and full load, and 94.8 per cent. at 0.8 p.f. The inherent reactance is 24 per cent. Air filters are used of the Visco type with 25 cells each.

Two oil-insulated air-cooled 4,000-kVA step-up transformers 3,300/33,000/66,000-V are installed. For providing the station services an air-injection vertical four-cycle Diesel engine is employed directly coupled to a 145-kW, 110-V generator.

Provision has been made for the addition of two further sets.

The turbine room is adjacent to the boiler house. The backs of the two boilers are nearest to the steam turbines and thus a short line of steam piping is used.

The control house and switchboard gallery form one side of the turbine room giving the switchboard attendant a view of the room. Each of the two boilers has a heating surface of 400 sq. metres. They are designed for working with either pulverised coal or oil fuel. Two independent coal-pulverising mills are situated under each coal hopper. Each mill is supplied with a magnetic separator and an air blower coupled to and forming part of the mill.

For oil firing, an air pressure system is supplied. Each boiler will have its own electrically driven induced-draught fan, superheater, feed water heater, economiser, &c. The normal rate of pulverised coal consumption per sq. metre is 94 kg., *i.e.*, 17.2 kg. per cu. metre of combustion chamber.

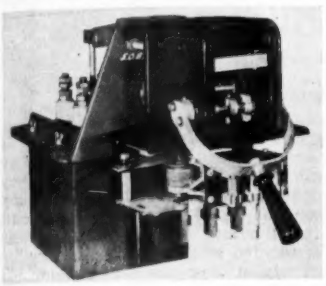
The output of the station is to be used to supply power continually to twelve pumping stations, each containing several vertical shaft pumps (now under construction) for working against a head varying from four to nine metres.

# New Apparatus and Devices

## for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

### A Small Oil Circuit Breaker

A new oil circuit breaker (Type BBO), complying with the requirements of B.S.S. 116—1929, has been added to the range made by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, for current ratings of 350 and 600-A up to 650 V. The frame, consisting of an inverted c.i. bracket, stiffened by ribs and webs, is arranged for mounting on the back of a switchboard, the four supporting bolts passing through the panel to secure the case in which are assembled the operating mechanism and protective devices; the parts on the front of the switchboard are enclosed in a sheet-steel cover.



M.V. oil circuit breaker

The stress due to closing the breaker is taken by the supporting bolts. The rear bracket carries the porcelain - clad terminal stems and contact mechanism, and also the welded-steel tank. The moving contacts are of the wound brush type engaging with rectangular copper blocks; both fixed and moving contacts have renewable screw-in arcing tips. The loose handle prevents the holding in of a breaker against the action of the automatic trips; it is claimed that an arc cannot be drawn by unskilful closing.

The link pins are of non-ferrous metal, and other important parts are of rustless steel. Any number up to four trip coils can be fitted, the selection being made from transformer-operated over-current coils with or without time-limit fuses, shunt trip coils, and an under-voltage release which can include a "no-volt no-close" device. Only 10 VA is required to operate the trips. The weight of the 350-V breaker (without oil) is 95 lb. Either size can be supplied "loose" or mounted on a panel.

### A New Vacuum Cleaner

THE NORTHERN STEEL & HARDWARE CO., LTD., 1 and 3, Southgate, Manchester, is making a new low-priced electric vacuum cleaner. The 200-W motor, manufactured by the B.T.-H. Co., is suitable for a.c. or d.c. supplies and is made for 100-110 V, 200-230 V, or 230-250 V. The machine is well insulated and is fitted with a patent suction intensifier ring giving a minimum suction of 28 in. w.g. The rubber-covered flexible cord is fitted with a combined lampholder adaptor and two-pin plug. The hose is of thick rubber entirely armoured and neatly braided. All accessories are chromium plated. The cleaner, which is guaranteed for twelve months, can also be used for blowing by removing the dust bag and inserting a tube in the deep aluminium end cover.

The "Northern" vacuum cleaner

### Low-voltage Network Protection

With a view to obviating the difficulties in restarting supply after a shut-down (when the switches of several main feeders operated in parallel cannot be closed simultaneously with consequent overloading and tripping out at the power station) STANDARD SWITCHGEAR, LTD., has developed a new system of which a forecast was given in an article entitled "Distribution Switchgear" which appeared in the ELECTRICAL REVIEW of March 25th. Oil switches of simple construction are fixed below the pavements at different points in the low-voltage network. Should the supply fail these switches are automatically opened by means of coils of the compound pressure type, so that each feeder is closed on approximately its normal load. At the same time the faulty section is located by the indication of the ammeter. After isolation or repair of the faulty cable, the section switch can be closed by hand.

### A Single-pole Toggle Switch

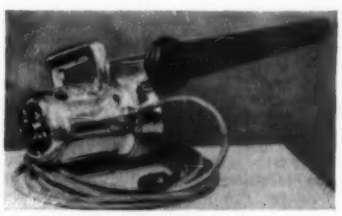
A. F. BULGIN & CO., LTD., Abbey Road, Barking, are producing a new single-pole quick-make-and-break toggle switch (the "S.102"). This has phosphor-bronze contacts tinned with pure soft solder, which are carried in a "Bakelite" moulding which forms the body of the switch. This moulding is on a plate riveted to a one-hole fixing bush inside of which is the special quick-make-and-break mechanism. A non-reversible "on-off" indicating plate is supplied with each switch. The contact made is of a wiping nature, and has a wedging motion. The switch is rated at 250V, 3 A, a.c. or d.c. A somewhat similar new switch, the "S.103," comprises a single-pole alternative-circuit switch.

### A New Sealing Tab

A line of small sealing tabs has been brought out by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1. They were originally designed for use with neutral connector boxes, but the device is applicable to almost any box secured with screws. The screw for fixing the box to the wall passes through a large hole in the tab, and the free ends are then bent over towards each other so that the sealing wire may be passed through a small hole at the end of each tab.

### An Improved Blower

THE MARTINDALE ELECTRIC CO., LTD., The Hyde, Hendon, N.W.9, is now manufacturing in Great Britain the "super blower" which it supplies; it was formerly made in America. It has been redesigned to meet the requirements of British conditions, and has a universal oversize ¼-h.p. motor made for 100 V, 220 V, or 250 V, mounted on Skefko ball bearings. The blower is fitted with a new type of connector with packing gland and 20 ft. of three-core Callender hard rubber flexible to which is attached a "Bakelite" b.c. adaptor with an earthing device. The weight is 7½ lb. Tests have shown that the blower gives a "U" water column of over 24-in. pressure, and a velocity of air of 265 ft. per sec. displacing over 50 cu. ft. of free air per minute.



The Martindale "super blower"

### Miniature Lampholders

The new miniature lampholders of the "BEEANTEE" ILLUMINATIONS, LTD., 70, Banner Street, Bunhill Row, E.C.1, are made in either b.c. or e.s. type for standard supply voltages. The holder is made of "Bakelite" and rendered water-tight by rubber covers at the junction of the lamp with the holder. Electrical connection is made by two sharp spikes which pierce the rubber of the cable, one on each pole.

### An Electrically Heated De-greaser

A new type of de-greasing plant (Type "D") for garage use has been developed by IMPERIAL CHEMICAL INDUSTRIES, LTD. The source of heat is six 3-kW immersion heaters, which are continually washed by boiling trichlorethylene and thus kept free from oil and grease introduced into the sump. Distillation of dirty solvent is effected by opening a tap when the sump has been drained; the current is cut off thermostatically, an indication of this being provided by pilot lamps on the switchboard, which also give warning if a heater element should fail. The plant is supplied complete with switchgear, relay, and thermostat. The switchgear is flameproof and is designed to meet the conditions for de-greasing plants in the L.C.C. explosive vapour area.

The I.C.I. de-greasing plant

# New Books

**The Modern Diesel.** vi.+142 pp.; 100 illustrations and diagrams. London: Iliffe & Sons, Ltd. Price 2s. 6d.

When talking of the Diesel engine, the electrical engineer usually has in mind the slow-speed multi-cylinder type which has been so successfully and economically employed for driving electrical generators. These engines, however, have a speed seldom exceeding 350 r.p.m., while the size of each cylinder may be such that it will develop as much as 1,000 h.p. In any case it is an engine almost as different from the type dealt with in this book as the steam reciprocator is from the steam turbine.

We will not go quite as far as the authors (who, by the way, are nameless) and imply that the "modern" Diesel is necessarily of the high-speed type, thereby suggesting that the slow-speed type is obsolescent, although it must be at once conceded that the high-speed compression-ignition engine does represent the latest and, to a certain extent, the most remarkable development in the realm of internal-combustion engineering practice.

These engines have been brought to a remarkable degree of perfection during the past two or three years, and this development has been almost entirely the work of British engineers. As the authors show, they have succeeded in producing units developing up to 140 h.p. in six cylinders, the engines having a speed of between 1,500 and 2,500 r.p.m., and a specific weight of 10 to 20 lb. per h.p. These engines run on fuel oil—although a refined Diesel oil is preferable—and taken in conjunction with their higher efficiency due to the higher compression ratio, they are very much more economical than the usual type of petrol or paraffin engine. As a consequence they are rapidly coming into extensive use for driving the heavier type of road vehicle, and they have also been tried for aircraft, for which their specific weight has been reduced to 2½ lb. per h.p.

The book gives a comprehensive survey of the various designs—now exceeding forty—which have been introduced to meet this growing demand, and constitutes a remarkably concise summary of what has been done to date.

So far the high-speed compression-ignition engine has only been used for transport purposes, but there appears to be no reason why it should not be employed for driving low-capacity electrical generators.

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**Thomas A. Edison.** By F. TREVELYAN MILLER. Pp. 287. London: Stanley Paul. Price 18s.

In the life history of Edison, no element is wanting that gives variety to a story of individual energy, enterprise and unflagging industry. This romantic story of the life of a man, who for a generation has been an almost legendary figure, is simple and full of interest. It is written with considerable inner knowledge; it shows a man who, though perhaps primarily an inventor and not a scientific philosopher in the sense that Kelvin was, nevertheless was still a philosopher in that he interested himself in the whole range of natural phenomena. His outlook on science was thoroughly Baconian in its insistence on immediate utility.

There is no record of any highly scientific discovery due to Edison, but he developed old ideas to a practical end, exhibiting outstanding independence of thought, unremitting diligence, and a peculiar intuition.

This volume tells with a most contagious enthusiasm many characteristic stories of Edison, of his early struggles, his inventions and extraordinary achievements. But the reader's most vivid impression is of the tremendous force of imagination, industry, and sheer practical genius, together with a close association between the man and his work. Edison began life with the poorest technical equipment, being his own instructor and the founder of his own fortune, but he possessed patient resourcefulness, a consuming intellectual curiosity, and a unique bent for experiment.

He was by far the most prolific inventor of the latter half of the 19th century, and during his very active life he applied for over 1,300 patents. It is estimated that the monetary value of industries either based wholly on his inventions or materially aided by them amounts to over £3,000,000,000.

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**Chromium Plating.**—By EDWARD S. RICHARDS. Pp. 131; figs. 70. London: Charles Griffin & Co., Ltd. Price 7s. 6d.

This volume describes the modern practical methods of chromium plating which are applied on a commercial scale, including the plating of aluminium, as well as wood, plaster, china, and other non-metallic materials. Chromium provides a surface that is highly resistant to corrosion, retains its original lustre for a considerable length of time, and permits any slight loss of lustre to be easily restored. During the last seven years the chromium-plating industry has developed with conspicuous rapidity and the technical difficulties which were encountered at the outset have now been largely overcome, especially those of the manipulation of the electrolyte and the elimination of porous deposits.

Modern practice is to deposit initially a foundation of nickel and cover this with a deposit of chromium, hence combining corrosion resistivity and permanence of lustre; the operation requires much experience and is attended with considerable difficulty due to the ease with which blisters are formed and also the difficulty of rendering the two deposits perfectly adherent.

The underlying deposit of metal appears to be prone to develop minute elongated cracks, and recent studies on the subject have shown this to be due almost entirely to the occlusion of hydrogen in the deposit. The nickel deposit is now highly polished in order to close any cracks and obtain a brilliant lustre before the chromium is deposited.

The modern chromium-plating industry is founded on the brilliant pioneer researches of Carveth and Curry in 1905, and more recent work on the subject has been in the direction of determining the effect of variations in the temperature of electrolyte and cathode density and type of deposit. Some attention has also been given to the effect of the addition of colloidal substances on the electrolyte and to the highly theoretical studies of internal stresses and strains in the deposited metals.

The author has treated the subject in a highly practical manner, the whole text being permeated with valuable information drawn from a long experience in the industry.

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## Shorter Notices

"The Street Railway in Massachusetts." By E. S. Mason. Pp. xi+222. London: Oxford University Press. Price 15s. 6d. The author is professor of economics at Harvard University and in this book he discusses the rise of the street railways under small isolated companies and their evolution into large combines. He includes a great deal of statistical data on the expansion of mileage, revenue and passengers. The main purpose of the volume is to give an "economic history" of the street railway, particularly in Massachusetts, although the elements of its rise and decline are the same throughout America.

"The Romance of London's Underground." By W. J. Passingham. Pp. x+243; figs. 86. London: Sampson Low, Marston & Co. Price 12s. 6d. This history of the "Underground" group makes engrossing reading and the story of the early difficulties is particularly interesting. Omnibuses and tramways are dealt with as well, and one chapter is devoted to the power stations. The photographs are well chosen to give a pictorial survey of the growth of London's railways, buses and trams.

"The South African Municipal Year Book," 1931-32. Pp. 529. London. E. G. Allen & Son, or Cape Town: P.O. Box 1136. Price 25s. Of particular interest to those in the electrical world is the section dealing with electric light and power. This includes a scale diagram of units sold in various South African towns, a map showing the position of municipal undertakings, and particulars of municipal plant and financial operations. Tables are given showing details of generating plants, tariffs, bulk supply, tramways, and private company supply. Another section gives particulars of tramway undertakings.

"Theory of Machines." By L. Toft and A. T. J. Kersey. 2nd edition. Pp. ix+408; figs. 272. Price 12s. 6d. "Hydraulics," by E. H. Lewitt. 4th edition. Pp. xii+372; figs. 163. Price 10s. 6d. "Alternating Current Bridge Methods," by B. Hague. 3rd edition. Pp. xiv+424; figs. 122. Price 15s. London: Sir Isaac Pitman & Sons.

"Rewinding Data for Direct-Current Armatures," by G. A. Van Brunt and A. C. Roe. Pp. 212; figs. 176. Price 15s. "Artificial Light and its Application in the Home." Pp. 145; figs. 43. Price 9s. "Electricity," by Lewis and Dillon. Pp. 91; illustrated. Price 3s. "The National Electrical Code Handbook," by A. L. Abbott. Pp. 473; illustrated. Price 18s. London: McGraw Hill Publishing Co.

"Physics in Sound Recording," by A. Whitaker, M.A., F.Inst.P. Figs. 12, pp. 24. London: Institute of Physics. Price 1s. 2d. post free.—Reprint of the seventeenth lecture in the "Physics in Industry" series, dealing with the principles on which the gramophone and talking film are based.

"Make Your Own Wireless Set," by F. J. Camm. Pp. 80, figs. 30. London: Geo. Newnes, Ltd. Price 6d. net.—This is the *Tit-Bits* wireless book and tells the home constructor how to assemble sixteen different circuits at a cost of from a few shillings to several pounds.

"The Recording and Reproduction of Sound," by A. G. D. West, M.A., B.Sc. Pp. 95, figs. 78. London: Royal Society of Arts. Price 3s. net.—Reprint of four Cantor Lectures in which the author shows how the gramophone engineer is striving for "naturalness" as revealed by scientific tests rather than human ear comparisons.

"Practical Wiring Systems," by L. M. Waterhouse. Pp. 172; illustrated. London: Gee and Co., Ltd. Price 5s., pocket edition 3s. 6d.

"Dielectric Phenomena." Vol. III, "Breakdown of Solid Dielectrics." By S. Whitehead. Pp. 346; figs. 140. London: Ernest Benn. Price 30s.

"Steam Power Stations," by G. O. McLean. Pp. 106, illustrations and tables. London: Crosby, Lockwood & Son. Price 7s. 6d.

"Experimental Electrical Engineering," by E. T. A. Rapson. Pp. ix+166, figs. 186. London: Sir Isaac Pitman & Sons. Price 3s. 6d.

"Communication Engineering," by W. L. Everitt; Pp. vi+567; figs. 335. London: McGraw Hill Publishing Co., Ltd. Price 30s.

"Electrical Machinery and Apparatus Manufacture." Vol. IV. Edited by Philip Kemp. Pp. viii+269; figs. 56. London: Sir Isaac Pitman & Sons. Price 6s.

# Science and Industry

## The report of the National Physical Laboratory

NEW industrial and scientific developments have necessitated the establishment of new branches of work at Teddington, and there has also been an appreciable growth of the paid-for work carried out for industry and Government Departments. The receipts from such work were £86,000 in 1923-24; they reached £100,000 in 1927-28 and averaged £105,000 in the three years following. While there was a reduction of the work performed for industry last year, it still remained above the level reached in 1927.

The report for 1931 (pp. 313, figs. 54, Stationery Office, 15s. net) shows that the number of tests undertaken during the year totalled 552,653, an increase of 10,938, but the number carried out in the Electricity Department decreased by 166 to a total of 2,338.

### X-ray and Radio-frequency Work

The uses of X-rays in industry are increasing. They have been applied at Teddington to elucidate the cause of variation in the magnetic properties of steel, to study the protective scales which can be formed on steel, paint materials, &c., by the revelation of the ultimate crystal structure. The International Committee's code of safety recommendations, for which the N.P.L. was largely responsible, is widely used. The Laboratory also undertakes the inspection of the X-ray departments of hospitals.

Chromium plating can vary from a brilliant hard deposit to a grey one with a matt surface and little lustre, depending on the conditions of the plating bath. By the use of X-rays it has been possible to track down the physical cause of these differences, which are due to the size and shape of the individual crystals in the deposit, and hence to assist in securing uniformly successful results.

Without a means of specifying the quantity, or "dose," the state of X-ray therapy would not be satisfactory, but it is evident that such an unsubstantial entity as a beam of X-rays will require a special unit and a special technique for its numerical evaluation. This matter has now been settled. A unit called the "Röntgen," in honour of the discoverer of X-rays, has been adapted and international agreement has been substantially reached.

For checking the frequencies of wireless transmitting stations an accuracy of one part in a million is aimed at, and it is therefore desirable that the fundamental standard used for such measurements shall be accurate to a few parts in ten million. During 1931 improved standardising equipment has been constructed and installed at the Laboratory, and it is now possible to determine the frequency of the Laboratory standard at any time with an accuracy of about one part in ten million by inspection of a chart on which a record is made automatically. The standard itself is a tuning fork maintained in oscillation by a thermionic valve.

Experiments have also been made with another form of frequency standard which promises to be even better than the fork. This consists of a ring cut from a quartz crystal, mounted so that it vibrates radially, *i.e.*, alternately expands and contracts. The vibrations are maintained and recorded by means similar to those used in the case of the tuning fork.

### Insulators, Cables, Meters

High-voltage porcelain overhead-line insulators are tested by the million-volt electrical plant at the Laboratory. Experiments carried out by the Laboratory staff at Glasgow on behalf of the Central Electricity Board showed that the greatest deposits are built up on the hollow under surface of the insulator, while on the outer surfaces, exposed to wind and rain, the deposits are of much lower density. It was also found that vertical surfaces remain comparatively clean, even in the still air of a black fog, and the most satisfactory results under bad conditions were given by insulators with a vertical or steep outer surface, which retained good insulating properties under all conditions.

Research into the heating of underground cables has been continued on behalf of the British Electrical and Allied Industries Research Association. The change-over from d.c. to a.c. distribution now taking place is introducing new problems and new investigations have recently been made to determine the additional heating effect of a.c.

Research into meter bearing and magnet deterioration has been of considerable help to manufacturers. All new types of meters are tested at the N.P.L. before being approved by the Electricity Commissioners.

Valuable results have been obtained from an investigation into the properties of pivot and jewel bearings which has been in progress for the past few years. Wear tests have shown that whenever a steel pivot is rotated in contact with a sapphire jewel in the absence of lubrication a heavy deposit of rust is actually formed as the pivot rotates, and does not develop in the absence of relative motion between pivot and jewel. The increase in friction during the wear test is largely due to the presence of this rust, which forms on "stainless" steel pivots on rotation exactly as on ordinary steel pivots.

Two important results emerged from experiments on the lubrication of pivot and jewel bearings. First, the presence of oil made no appreciable difference to the friction between a new pivot and jewel. Further experiments were carried out, however, in which a pivot was rotated in contact with a stationary jewel under conditions similar to those existing in an electricity meter. Two identical bearings were used, but one was run dry and the other lubricated. The first had a useful life of only half a million revolutions, but the lubricated one gave a useful life of fifteen million revolutions. The work is being continued on behalf of the British Electrical and Allied Industries Research Association.

The use of electrically welded joints instead of riveted joints in steel-frame buildings and structures is a new development in this country, which may be of marked importance in reducing the cost of construction and eliminating the noise of riveting. In this connection an extensive series of strength tests are now being undertaken for the Steel Structures Research Committee to obtain information on the reliability and strength of welds of the types which are likely to be used in this work.

### Radio Beacons and Receivers

In 1929 a wireless beacon transmitter was set up by the Board of Trade and the Air Ministry at Orfordness on the East Coast. From the study of reports received from a large number of ships at sea, it has been found that the reliable working range of the present beacon is about 100 miles. At greater distances the observed bearings are accurate in the daytime, but at night they are subject to variable errors of the type frequently met with in wireless direction-finding. The Laboratory is therefore investigating on behalf of the Radio Research Board the possibilities of adapting another type of aerial system to the beacon transmitter. Certain basic features of the design of a station which should give a reliable bearing range of 300 to 500 miles have been settled, but further experiments have yet to be made to provide other necessary data.

During the past few years the N.P.L. has been developing apparatus for testing wireless receivers. This apparatus consists essentially of a model transmitter which is completely enclosed in a screened metal room. The receiver, which may be of any type, is housed in another somewhat similar room and receives the radiation from this transmitter, the wavelength of which can be varied over wide limits to simulate the actual conditions of reception in the home. This apparatus has been considerably improved during 1931 in the light of recent researches at the Laboratory. Such testing equipment marks an important contribution to the science of radio technique, for the relative qualities of commercial receivers as regards selectivity, sensitivity, and audio-frequency fidelity can now be stated in a form which should lead to important advances in design.

### Aerodynamics

A feature of the N.P.L. is the extensive use made of electrical methods to enable non-electrical measurements and investigations to be carried out. For instance, the new air tunnel now being constructed consists essentially of a wind tunnel enclosed in a steel shell of great strength so that tests can be made in compressed air instead of at normal atmospheric pressure, which is equivalent to a corresponding increase in the product of the model size and the wind speed. Thus a wind speed of about 90 ft. per second will be attained at 25 atmospheres pressure, and this wind, blowing upon a model of 1/110 scale, will simulate precisely the conditions of the full-scale machine flying at 225 ft. per second, or 153 m.p.h. The total weight of the tunnel structure is 310 tons. The air is circulated by a metal airscrew, or fan, driven by a 400-h.p. motor. Air is compressed into the shell by three 400-h.p. compressors housed in an adjoining room, and capable together of charging the shell to the full pressure of 25 atmospheres in about 80 minutes.

Models are suspended in the air current from suitable balances; as a man cannot work inside the shell, it is necessary to transmit the readings of the balances to a point outside. This is accomplished by the use of electric balances which have been designed at the Laboratory. The air forces to be measured are balanced by electromagnetic attractions between coils of wire, the current in which is controlled from outside the tunnel. The current required for balance is measured and thus gives a direct indication of the air force acting on the model.

### Metallurgy

X-ray crystal analysis makes it possible to determine the way in which the atoms of crystals are arranged, even when the crystals are too small to be examined microscopically. The X-ray spectra of different crystals are as a rule easily distinguishable, so such examination will often show whether a given material consists of one or more different crystalline species.

The Laboratory has carried out important pioneer work on light alloys, consisting of a light basis metal, *e.g.*, aluminium or magnesium, with minor amounts of other metals. These materials, combining lightness with strength, occupy an increasingly important position in engineering practice.

Whereas ten years ago beryllium was a scientific curiosity, successful methods of production have been rapidly evolved. Pure beryllium has now been obtained, and has been found to be ductile and strong. (See p. 668 of this issue.)

# The "Sofina" Report for 1931

## Progress during the depression

THE directors of the Société Financière de Transports et d'Entreprises Industrielles ("Sofina"), which has interests in electricity supply and tramway companies in North and South America, Northern Africa, and a number of countries in Europe, and also holds an interest in the Electric and Railway Finance Corporation, Ltd., have recently issued their report for the year 1931. In this it is pointed out that while Sofina's subsidiaries and the companies in which it has important interests have been unaffected by the world crisis, the Compagnie Générale de Tramways de Buenos Ayres is the only one whose position has been seriously impaired. Electricity supply undertakings have practically maintained their output, some having slightly exceeded the figures for the preceding year; as a rule, increased sales of electricity for lighting and domestic purposes have offset the decline in industrial consumption.

The report reviews world economic conditions and suggests the way out of the present difficulties. Dealing with electricity in periods of expansion and of depression, it states that the development of the electrical industries is a striking example of the benefits of technical progress. Electricity has given rise to industries for the production of electrical equipment and has increased the capacity of the industrial nations to make purchases abroad. Thus in 1913 Great Britain, the United States, Germany, France and Switzerland exported electrical material and apparatus to an aggregate value of 819 million gold francs; in 1929 the value of their exports of the same kind exceeded two milliard gold francs.

### Electricity's Continued Advance

Electricity has especially lightened domestic labour. In the United States the consumption of electrical energy for domestic purposes increased from 260 kWh per head of population in 1915 to 550 kWh in 1930. In Switzerland it increased from 304 million kWh in 1928 to 458 million kWh in 1930, equivalent to an increase from 76 to 114.5 kWh per head of population. For the use of refrigerators alone in the United States—in 1930 these numbered 2,625,000—the annual consumption exceeded 1,000,000,000 kWh. In spite of the crisis the number of houses connected to distribution systems has everywhere increased. Almost every country in which distribution has developed rapidly owes this expansion mainly to private initiative. Municipalities, in an increasing measure, are passing on these services to private enterprise. In the United States the number of municipal electricity undertakings declined from 2,581 in 1922 to 1,288 in 1931.

As a result of the facilities afforded by electricity to the agricultural industries, rural electrification is spreading rapidly. In the United States 166,000 farms were connected in 1923; this number rose to 558,000 in 1929 and 644,000 in 1930, notwithstanding the fall in the price of agricultural products. Nearly 80 per cent. of German agricultural undertakings are connected to distribution systems, while in Great Britain the number of electrified farms has increased five-fold since 1923. In France nineteen rural systems supply nearly five-sixths of the population in the districts which they cover.

### The Industrial Demand

In industrial works electricity is being increasingly substituted for other forms of power. It is estimated that already four-fifths of the motive power employed by all the industries in Germany is supplied by electricity. The electrification of railways is also progressing. Owing to the multiplicity of uses to which electricity can be applied, it is one of the few products for which the demand has only slightly declined. The reduced consumption in industrial manufacture has been compensated to a great extent by the increased demand on the part of other customers. The consumption of electricity in 1931 in most of the industrial countries has been appreciably less than in 1930; but even in those which have suffered most from the crisis, it has still nearly equalled, where it has not exceeded, the figures of 1928, and this was in spite of the fact that in 1931 the "index of industrial production" showed, as compared with the 1928 figures, a decline of 17.3 per cent. in Canada, 11.5 per cent. in France, 29.5 per cent. in Germany, 12.1 per cent. in Great Britain, and 26.3 per cent. in the United States.

There has been no over-production of electrical energy, but in those countries where electrification is most advanced the productive capacity of the plants now in existence or in course of construction is greatly in excess of the present requirements. The extension of electrical services would be arrested or would suffer a setback if the present industrial stagnation continued or became worse, if impoverished populations ceased to strive for higher standards of living, or if depreciated wages made manual labour cheaper than mechanical power.

# Conditions in Brazil

## Restrictive measures reduce electrical imports

A REPORT by Mr. J. Garnett Lomax, commercial secretary to H.M. Embassy at Rio de Janeiro, on economic conditions in Brazil has just been published by the Department of Overseas Trade. It is obtainable from the Stationery Office, price 2s. 6d. net.

In a general survey of conditions, Mr. Lomax says that Brazil has presented stubborn resistance to the prevailing depression. Coffee prices have fallen considerably in spite of the various measures which have been introduced in support of this crop which represents a very large proportion of Brazilian export trade. As a result less exchange cover has been available in the market to meet import requirements and the volume of import trade has decreased, this reduction being partly due to a fall of some magnitude in the exchange rate of the milreis.

The balance of trade has therefore further developed in Brazil's favour, but in spite of this fact it has been necessary to suspend the service of a considerable part of the Foreign State and Federal Debt. Brazil is, however, to a large extent self-supporting, and as there will always be a certain sale for her coffee she will be in a position to meet her modest requirements for imported goods.

The fall in exchange which has occurred, together with the increased protection of the tariff, has had a favourable influence on a number of industries which have been established in Brazil. A summary is given of the measures under consideration for the complete revision of the customs tariff, and Mr. Lomax adds that it is most necessary for British firms interested in the Brazilian market to keep in close touch with any development in this tariff revision.

### Methods of Distribution

With regard to methods of distribution in the country it is stated that it is practically impossible for manufacturers of machinery and other products of a technical nature to enter the market merely by the expedient of appointing an agent. The majority of resident firms competent to sell technical materials are already monopolised, and there is no reasonable alternative for manufacturers desiring to enter the market other than the establishment of selling organisations on their own account, or at least the maintenance of their own salesmen attached as a special department to one of the existing merchants. For manufacturers whose potential distribution does not justify the establishment of a branch, the group system is a useful alternative.

Some details of the electrical export trade are given in an appendix and the figures are summarised below:—

| | 1929. Thous. £. | 1930. Thous. £. | Inc. or dec. Thous. £. |
|---|---|---|---|
| *Insulated electric cables and wires—* | | | |
| Total | 548 | 346 | − 202 |
| From Great Britain | 277 | 170 | − 107 |
| „ United States | 118 | 50 | − 68 |
| „ Germany | 38 | 20 | − 18 |
| *Electric lighting material and apparatus—* | | | |
| Total | 1,697 | 1,188 | − 509 |
| From Great Britain | 190 | 144 | − 46 |
| „ United States | 794 | 507 | − 287 |
| „ Belgium | 183 | 208 | + 25 |
| „ Germany | 270 | 145 | − 125 |
| *Dynamos and generators—* | | | |
| Total | 281 | 151 | − 130 |
| From Great Britain | 18 | 17 | − 1 |
| „ United States | 150 | 72 | − 78 |
| „ Germany | 72 | 35 | − 37 |
| *Electric motors—* | | | |
| Total | 332 | 176 | − 156 |
| From Great Britain | 43 | 33 | − 10 |
| „ United States | 116 | 73 | − 43 |
| „ Germany | 71 | 20 | − 51 |
| „ Italy | 17 | 18 | + 1 |
| *Transformers—* | | | |
| Total | 382 | 274 | − 108 |
| From Great Britain | 54 | 44 | − 10 |
| „ United States | 245 | 176 | − 69 |
| „ Germany | 52 | 21 | − 31 |
| *Radio apparatus and accessories—* | | | |
| Total | 124 | 123 | − 1 |
| From Great Britain | 3 | 23 | + 20 |
| „ United States | 78 | 64 | − 14 |
| „ Germany | 39 | 20 | − 19 |

### X-ray Crystal Analysis

The discourse to be given by Sir William Bragg at the Royal Institution Conversazione this (Friday) evening will be related to the various developments in pure and applied science which have depended on the use of the X-ray methods of analysing crystal structure. To supplement the discourse an exhibition is being arranged in the rooms of the Royal Institution; the contributors will be those who have carried on research work in this subject in various British laboratories. The managers of the Royal Institution invite interested persons to call at the Royal Institution, 21, Albemarle Street, W.1, at any time between 10 a.m. and 6 p.m. on May 9th or 10th, and to leave their names and addresses.

# Business and Industrial Notes

**The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures**

## Standard Telephones to Make "Philco" Sets

The Philco Radio and Television Corporation of Great Britain, Ltd., announces that its "Philco" radio receivers will next season be made in England by Standard Telephones & Cables, Ltd. The Philco Company is one of the world's largest manufacturers of radio receivers, and in 1931 produced approximately a third of the total number of receivers made in the United States. The Hendon and Southgate factories of Standard Telephones & Cables, Ltd., are already making active preparations for the manufacture of these sets, which will afford employment to several hundreds more men and women.

## Stage Lighting in Burma

The General Electric Co., Ltd., has sent us a photograph (reproduced herewith) of a Burmese theatrical performance. Its electrical interest lies in the fact that the lighting is provided by means of a small Lister Diesel set, and "Gecoray" reflectors and "Osram" lamps are employed. We are informed that this particular entertainment lasted for nine and a half hours, which is a testimony to Oriental endurance.

**"Gecoray" reflectors in a Burmese setting**

## Developments at Worksop

A review of the progress made by the Electricity Department in modernising its distribution system is given in the spring issue of the "Worksop Corporation Electrical Magazine." Considerable work has been carried out in connection with the change-over to a.c. and the extension and replacement of mains generally, and the Corporation has commenced the installation of a supervisory control system for all substations; up to the present three of the most vital points have been connected up with the power station by this means. In the same issue of the magazine is an article by Mr. A. Cowlishaw on "Is Electrical Heating a Commercial Proposition?," a description of the electrical plant at the Co-operative Society's bakery, and a number of other interesting features.

## Municipal Contracting at Poplar

Twelve months or so ago the Poplar Electricity Committee inaugurated an Installation Department in connection with the Council's assisted-wiring scheme. The Committee now reports that the trial period has proved the Department a success, and it is proposed to continue it. It is stated that the total number of points installed during the ten months ended January 31st last was 1,539 and the total cost £1,546—practically £1 per point, inclusive of 10 per cent. establishment charges. These figures include lighting points, 5-A and 15-A plug points, and two-way switches.

## Works Visit

A party of seventy lecturers and students from the Bolton Municipal Technical College visited the works of Ferguson, Pailin, Ltd., Higher Openshaw, Manchester, on April 20th, where they inspected 132,000-V equipment being manufactured for the grid, and the 500,000-V testing laboratory. All departments of the works were visited, and the party was considerably impressed by the insight the visit afforded into the latest switchgear developments.

## An I.C.I. Exhibition

Last Monday Imperial Chemical Industries, Ltd., opened an exhibition of their products in conjunction with the Royal Institution of British Architects at Thames House, Millbank, S.W.1. This includes a very attractive display of lighting fittings and glass shades. A striking contrast is provided, since in one room used for demonstrating lighting fittings is a display of modern glass shades of all kinds, including new tubular and cylindrical types only recently placed on the market, while the demonstration room next to it contains fittings of old fashioned type, mostly in the form of chandeliers with electric "candles." One is an exact replica of a chandelier at Hampton Court. Strip lighting effects, electric clocks and telephones are also shown. The exhibition is to remain open until May 16th.

## British Financial Policy

A Federation of British Industries report dealing with the industrial and monetary policy of this country asserts that the recovery of British trade is impossible unless steps are taken to draw up a comprehensive plan of industrial defence and development. It says that the time has come when we must put an end to the policy of lending British money to reconstruct the industrial systems of our rivals in Europe. British finance from now onwards must be devoted to British industries at home and in the Empire, and to those countries outside which are prepared to co-operate in a British system by offering in exchange goods and services of a non-competitive kind.

## Duty Modifications

The Import Duties Advisory Committee announces that applications, whether in relation to additional duties or to the Free List, should be made, so far as possible, by representative bodies of the trades concerned. The Committee does not propose to proceed as a rule by formal hearings. Applicants, therefore, should submit their case fully in writing and the Committee will call for such supplementary statements, oral or written, as may be required. The Committee will from time to time give notice of cases in which it is considering the question of the imposition or modification of "additional" duties, or of variations of the Free List, in order that interested parties may have the opportunity of making representations.

## Petters at Dublin Show

Among the internal combustion engines and pumping plant which Messrs. Petters, Ltd., are exhibiting in the machinery paddock at the Royal Dublin Show this week (May 4th to 7th) is a No. 102 "Petter-Light" belt-driven generating set. This outfit comprises a 3 b.h.p. "M" type paraffin (or petrol) engine with a 50-V dynamo on a combined baseplate, including a neat switchboard carrying all controls and instruments for regulating the supply of current, battery charging, starting, &c. The output of this set is 1,250 W. Batteries can be supplied with a capacity of 100 Ah. An advantage of this belt-driven set is that when not required for generating electricity, the belt can be removed and the engine used to drive a pump or other small machine.

## A Prize Window Display

During the week ended March 19th last Hoover, Ltd., held a window display contest in connection with its spring campaign for which a large number of municipal undertakings and electricity supply companies entered. The accompanying illustration shows the display of the Southport Corporation Electricity Department which was awarded the first prize. Other prize winners were Messrs. R. Alger & Sons, Ltd., Newport, Mon., and Bradford Electricity Department, who secured second and third prizes respectively, and the Northampton Electric Light and Power Co., Ltd., and Messrs. Parker, Winder & Achurch, Ltd., who tied for the fourth prize.

**A Hoover prize window display at Southport**

## Japanese Gasfilled Lamps

With the Government's formal refusal to extend the Tokyo Electric Co.'s Japanese patent on gasfilled electric lamps which recently expired, and in view of the severe competition that is expected to ensue in the electric lamp trade in Japan, the Japanese lamp manufacturing concerns are now making

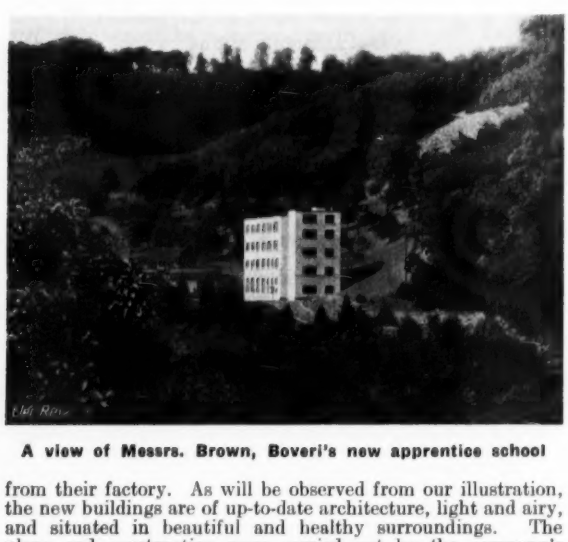
efforts to meet the situation. According to the *Far Eastern Review*, the manufacturers are planning to form an association in order to adopt measures for promoting the improvement of their products and the future expansion of the market both within the country and abroad. The first step was taken at a conference at which representatives of five concerns were present. It is understood that the Tokyo Electric Co., which has lost its monopoly, is preparing to meet the situation by price reductions. Our contemporary adds that it was recently revealed that some of the Japanese commercial houses in London have been negotiating with the smaller lamp manufacturing concerns in Japan in connection with the export of Japanese gasfilled lamps to England.

### Cable Manufacture in Japan

The Sumitomo Cable Co. of Osaka, which belongs to the copper group of the same name, has commenced the erection of an extensive cable factory which, it is claimed, will be able to cover most of the cable requirements of Japan.

### New Brown, Boveri Apprentice School

Owing to the steady growth of its Baden works and the resultant increase in the number of apprentices attending its existing works school to over 500, Messrs. Brown, Boveri & Co., Ltd., have recently opened a new school some distance



**A view of Messrs. Brown, Boveri's new apprentice school**

from their factory. As will be observed from our illustration, the new buildings are of up-to-date architecture, light and airy, and situated in beautiful and healthy surroundings. The plans and construction were carried out by the company's Building and Construction Department, and from the commencement of its foundations to the final completion the erection of the buildings took only just over six months. The school will also relieve overcrowding at the Baden trade school.

### Local Exhibition

An exhibition organised by the Edinburgh branch of the General Electric Co., Ltd., in conjunction with the Kirkcaldy Corporation Electricity Department and local contractors, was opened on April 27th in the Beveridge Hall, Kirkcaldy. Among the appliances on view are wash boilers, cookers, vacuum cleaners, &c. There is also a wireless section and a tradesmen's section, the latter including various shop-window lighting devices.

### Education for Management

Professor P. Sargant Florence, of the Faculty of Commerce, Birmingham University, is to give an address on "Education for Management" before the Business Research and Management Association next Wednesday, May 11th, at Anderton's Hotel, Fleet Street. A number of seats will be available for visitors.

### Finnish Electrical Imports

A Department of Overseas Trade survey prepared by the Commercial Secretary at Helsingfors states that in 1931 the total turnover of Finland's foreign trade was the smallest since 1919, the favourable balance being more than twice as large as in any previous year. Imports of electrical machinery, however, during 1931 amounted to 1,800 metric tons, which was 362 tons above the 1930 figure, while insulated electric cable imports also showed an increase from 1,457 to 1,794 tons. The country's tariff policy during the last two years has been becoming more and more protectionist, and considerable increases in duties have been enforced.

### Social Events

The Brighton and District Electrical Trades Golfing Society held its first evening competition at the Dyke Golf Club, Brighton, on April 28th. There were fourteen entries, and the leading results were:—Mr. A. Murray Coombs, 77 net; Mr. A. E. Hewett, 79; Mr. E. Colvill, 79; and Mr. A. Geall, 80. The hon. secretary of the Society is Mr. E. Colvill (Cryselco, Ltd.), 59, Ship Street, Brighton, and the annual subscription is 5s.

On April 23rd the football team of the Birmingham section of Callender's Athletic and Social Club won the "Black and White" cup of the Birmingham and District Works Amateur Football Association, by defeating the team of Messrs. J. Lucas, at Grove Park, Handsworth. Callender's team also won the Piggott Memorial Shield and the championship of the league. To celebrate its success, the team was recently entertained to dinner and a smoking concert at the Crown Hotel, Birmingham, by Mr. G. Barnard, the company's Midland district engineer and manager.

### Irish Free State Electrical Imports

A very quiet tone continues to prevail in the electrical trade of the Irish Free State, the imports of electrical machinery, fittings, and apparatus during the two months ended with February last having attained a value of £95,801, as compared with £117,906 in the corresponding period of last year. The details of the imports are appended:—

| | January-February. 1931. | 1932. |
|---|---|---|
| | £ | £ |
| Electric machinery .. .. | 31,498 | 26,665 |
| Electric wires and cables .. | 20,654 | 13,497 |
| Wireless sets and parts .. | 21,000 | 24,407 |
| Electric lamps and parts .. | 9,951 | 8,343 |
| Other electrical goods .. | 33,118 | 21,499 |
| Copper wire .. .. .. | 1,595 | 1,390 |
| Total .. .. .. | £117,906 | £95,801 |

As will be seen the trade shows a decline of £22,105, radio goods being the only class showing an improvement.

### Lloyd's Import Duties List

A third edition of "Lloyd's Import Duties List" has been published by the Corporation of Lloyd's, London, E.C.3. It has 84 pages and costs 6d. (7½d. by post).

### Wire Tables and Data

A new edition of "Useful Tables and Data for the Assistance of Consumers of Wire" has just been published by Messrs. W. F. Dennis & Co. (price 2s. 6d.; in leather case 3s. 6d.). The booklet has 56 pages and its handy size and concise form render it of the utmost service to all concerned with wire and wiring.

### The Shakespeare Memorial Theatre

Referring to the article which appeared in our last issue under this heading, we are informed by Siemens Electric Lamps & Supplies, Ltd., that they also supplied lamps for the theatre, and that the tubular lamps illustrated on p. 623 are of their manufacture.

### Trade Announcements

Messrs. Newtons of Taunton, have changed their title to Newtons of Taunton, Ltd. (proprietors: Joseph Lucas, Ltd.). From May 1st their Accounts Department will be situated at the Midland offices, Well Street, Birmingham.

The head office of the Dowsing Radiant Heat Co., Ltd., has been transferred to the company's works at Bollo Lane, Acton, W. The showroom at 91 and 93, Baker Street, W., will be retained.

Gee Jay Supplies (Wholesale), Ltd., 18, High Street, Holywell, Flints., have been appointed sole district distributors in North Wales for "Vac-Tric" vacuum cleaners and "Eddo" domestic electrical specialities.

### Persian Import Restrictions

Under the Persian Trade Monopoly Law import quotas have been fixed for the year ending June 21st, 1933, for certain goods, including telephone and radio-telegraph apparatus (1,000,000 krans), and electrical material (828,000 krans).

### For Sale

Factory buildings in Blackfriars Road and at Slough are to be sold by auction on May 24th by Messrs. Leopold Farmer and Sons.

Salford Corporation invites offers for the purchase of an electric crane.

(See our advertisement pages to-day.)

### Cookery Competition for School Children

An electric cookery competition for school children was held recently in the showrooms of York Electricity Department. A representative scholar from each school attended and the results were most satisfactory, reflecting credit on the girls' training and the simplicity of the electric cooker.

### German Lamp Prices

In connection with the opening of an incandescent lamp museum in Berlin, Herr Meinhardt, the general director of the Osram Company, said that it was untrue that through international agreements the company had been compelled to a price policy which was against the interests of German consumers. There was also no foundation for the allegation that the company bought up patents in order to stifle them and exclude troublesome competition. The life of a lamp (about 1,000 hours) was most favourable to the consumer and this was fixed also in the agreements with consumer associations in other countries, and, moreover, there was not the slightest connection between the life of lamps and the reduction in prices. At present about 65 million lamps were used in Germany every year, and despite the most careful tests slight defects in manufacture could not always be avoided. Before the war a 25-W lamp was priced at 1.95 marks, but

it was now 95 pfennigs. This price included the 20 per cent. lighting tax and the rebate of 25 to 35 per cent. allowed to merchants. Out of the remaining 50 to 55 pfennigs there had to be defrayed the costs of the external organisation, the administrative expenses, and the costs of production and profits.

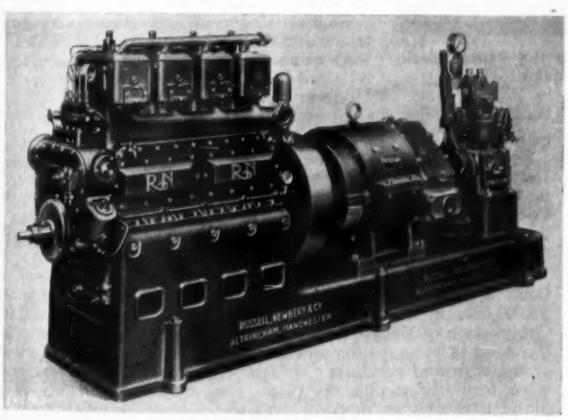
## F.B.I. Business Forecast

The Federation of British Industries "Business Forecast" for the second quarter of this year, contained in the "F.B.I. Business Barometer," states that there has been no material alteration in world conditions since the publication of the forecast for the first quarter. The most serious centre of instability continues to be Central Europe. Great Britain has made good use of the elasticity and freedom of movement which she regained by her departure from the Gold Standard. The new tariff has already been fruitful in alleviating unemployment and promoting the setting up of new industries, and the Ottawa Conference and the commercial agreements which will doubtless be negotiated subsequently with other countries, should serve to consolidate a *bloc* of sterling inter-trading areas. It should also help to bring to an end the period of falling prices but progress in all these directions is bound to be slow.

## Recent Contracts

The Westinghouse Brake and Saxby Signal Co., Ltd., has received orders from the Central Electricity Board for rectifier sets for trickle-charging tripping batteries for the 132-kV substations. These sets include a double wound transformer of a special design, by means of which the trickle charge rate may be adjusted within very fine limits. A "bridge" connected metal rectifier giving full-wave rectification is fitted inside the framework, which carries a steel panel with meters, fuses and switches, the whole being arranged for wall mounting. Two sizes, 0.75 and 1.5 A, are used, depending on the capacity of the sub-station, the operating battery being 110 V. This battery supplies the power for operating the closing mechanism for the 132-kV switchgear in addition to various indicating and interlocking circuits. Many of the sub-stations are remotely controlled. Larger chargers have been supplied to the main distribution centres for keeping the indication batteries charged.

The "R.N." Diesel Engine Co. has recently shipped a new Diesel engine to Vancouver for use in a tug already propelled by a 400-h.p. Diesel. This is a 4-cylinder engine developing 36 b.h.p. at 1,000 r.p.m., and is direct coupled to a d.c. generator with an output of 20 kW at 115 V and a compressor having a displacement of 22 cu. ft. of free air per minute, and compressing 250 lb. per sq. in. The generator is to be used to operate the electric winches on the tug, and also for lighting purposes. On test it was found to give an output of 23 kW without overloading and the fuel consumption was 0.68 lb. per kWh, while the speed variation from full load to no



**A Diesel set for a tug**

load was only 3 per cent. The governing was good and none of the usual Diesel knock was noticeable even when the load was increased suddenly.

The order for the first official broadcasting station in Portugal has just been placed by the Portuguese Administration of Posts and Telegraphs with Standard Telephones & Cables, Ltd., who are building the new Empire broadcaster for the British Broadcasting Corporation and the 100-kW Kalundborg station for the Danish Government. Hitherto Portuguese listeners have been dependent on a number of low-power stations operated by amateurs, and this will be the first high-power station to be run under Government auspices. The station will be erected at Lisbon, and will be manufactured at the Hendon works of the company. It will have an unmodulated carrier power of 15 kW corresponding to a total antenna power of 20 kW when the carrier is modulated. The station will embody all the latest improvements, including crystal control, and will work on a wavelength of between 400 and 500 metres.

## Modernisation of Factory Equipment

The economic depression, together with excessive competition, has left a large proportion of industrial concerns with permanently depleted resources and out-of-date equipment. To give manufacturers the opportunity to modernise their plant in preparation for a return to prosperity, the London Industrial Finance Trust, Ltd., Farleigh House, Lawrence Lane, Cheapside, E.C.2, is offering facilities for "intermediate credit," or hire-purchase, to buyers of engineering equipment. Lord Barnby is chairman of the Trust, the other directors being Col. R. K. Morcom and Messrs. D. A. Bremner, A. R. Baker, C. Y. Palitz and J. A. Demarest (general manager).

## Prices of Materials

Messrs. F. Smith & Co. report, May 4th: No change in the prices of silicium bronze wire and electrolytic copper.

Messrs. Edward Till & Co. report, May 4th: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, May 4th: No change in the prices of copper bars (best selected), sheet and rod, and English pig lead.

## New Catalogues and Lists

**W. T. Henley's Telegraph Works Co., Ltd.,** Holborn Viaduct, E.C.1.—An illustrated folder describing a new range of Henley link disconnecting boxes.

**A. Reyrolle & Co., Ltd.,** Hebburn-on-Tyne.—Pamphlets Nos. 824 and 838, describing respectively metalclad unit-type distribution gear and the superimposed interlock protective system for overhead transmission lines.

**Electro-Dynamic Construction Co., Ltd.,** Devonshire Grove, S.E.15.—An illustrated leaflet on polyphase variable speed motors.

**M. & C. Switchgear, Ltd.,** Kelvinside, Kirkintilloch, Glasgow.—Pamphlet No. K81/3, dealing with metal-clad oil-break switchgear.

**B.E.N. Patents, Ltd.,** 92, Tottenham Court Road, W.1.—Folder C.B.17, giving prices and particulars of the company's wide range of air compressors.

**Elliott Brothers (London), Ltd.,** Century Works, Lewisham, S.E.13.—A number of catalogue sheets, illustrating and describing current and voltage transformers.

**Yarrow & Co., Ltd.,** Scotstoun, Glasgow.—An illustrated catalogue relating to Yarrow boilers for the merchant service.

**Marconiphone Co., Ltd.,** 210-212, Tottenham Court Road, W.1.—Four coloured posters depicting various Marconiphone models in attractive settings.

**Electric Depot, Ltd.,** Pritchett Street, Aston, Birmingham.—A price list of steel frame cable racks.

**Bruce Peebles & Co., Ltd.,** Edinburgh.—Pamphlet No. 26 dealing with distribution transformers for pole, platform, wall, or floor mounting.

**L. C. Hawkins & Co., Ltd.,** 30-35, Drury Lane, W.C.2—The May issue of "The Link," containing particulars of "Reco" potato peelers, "Red Lion" pressers and pleaters, "Supreme" mirrors, electrical accessories, &c.

**Igranic Electric Co., Ltd.,** 149, Queen Victoria Street, E.C.4.—Several leaflets dealing with motor starting switches, starters, controllers, field rheostats, magnets, magnetic brakes, &c.

**English Electric Co., Ltd.,** Stafford.—Publications Nos. N.34, 973A and N.48, relating respectively to "monkey" switch-fuses for rural distribution, handle-type cartridge fuses and flame-proof switch pillars.

**Eisler Electric Corporation,** 744-772, South 13th Street, Newark, New Jersey, U.S.A.—An illustrated catalogue of spot welders.

**Edison Swan Electric Co., Ltd.,** 123-5, Queen Victoria Street, E.C.4.—Publication A.735, illustrating and describing moulded electrical accessories. Also leaflet A.652 on the Ediswan "Junior" ironclad switch and switch-fuse.

## Private Arrangement

**J. H. Gath** (lately trading as Gath Electrical Engineering Co.).—A statement issued by Mr. E. Sproat, trustee, shows that the total payments into the bank to April 16th were £107 and the total paid out was £102. The winding-up of the estate cannot be completed until commission earned by the debtor has been received; this is not payable until certain contracts have been completed.

## Bankruptcy Proceedings

**T. H. C. Hughes,** electrical and wireless engineer, 1,090, Manchester Road, Bradford.—This debtor attended at the Official Receiver's office, 71, Manningham Lane, Bradford, on April 29th, for his first meeting of creditors. He had prepared a statement of affairs which showed gross liabilities of £371, of which £366 was expected to rank for dividend. There were net assets of £174, leaving a deficiency of £193. The debtor attributed his failure to general depression in trade and keen competition. The case being a summary one was left in the hands of the Official Receiver, as trustee.

**Alice M. Hyde,** electrical and radio engineer, 4, Duke Street, Congleton, Cheshire.—The public examination was held recently at the Town Hall, Macclesfield, when a statement of affairs was submitted which showed a deficiency of £280. The debtor stated that her husband had formerly carried on business as a radio engineer, and on his death in February, 1930, she took over the concern. The liabilities then amounted to £400, but she anticipated being able to discharge them and sell the business. She had been able to reduce the liabilities to some extent, but any profits she had made in the business had been absorbed by housekeeping expenses.

**E. L. Spring,** electrical and wireless dealer, 61, Dovecot Street, Stockton-on-Tees.—The public examination took place at the Court House, Bridge Road, Stockton-on-Tees, on April 28th. The debtor had prepared a statement of affairs which showed a deficiency of £317, which he attributed to illness, having to sell wireless goods at cut prices owing to severe competition, and a loss of over £100 in depreciation of goods, trade fixtures and fittings. The examination was adjourned.

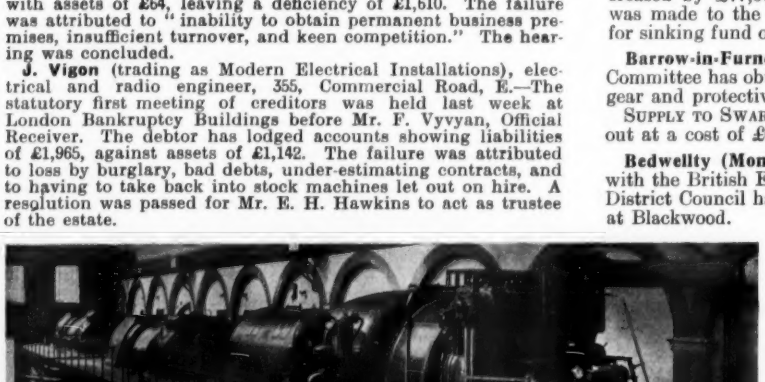
**L. E. Holland,** electrician, 4, St. James's Churchyard, Haymarket, formerly of Horsfield, both Bristol.—The public examination was held recently at the Guildhall, Bristol, when a

statement of affairs was submitted which showed assets of £25. That sum, however, was absorbed by preferential claims, and there was a deficiency of £302. Debtor stated that he had had experience of the electrical trade, and then commenced business on his own account, without capital, at Chelsea Park, Easton. He admitted that he was unqualified to conduct a business, and would have done better if he had been employed. The examination was closed.

**T. N. Lowden,** valve manufacturer, 46, Heathfield Road, Acton, Middlesex.—The receiving order was made recently on a creditor's petition, and according to a statement of affairs filed there are liabilities of £9,458 and no assets. Debtor attributes his failure to "loss of £4,300 and trade caused by the failure of a limited company; being unable to supervise his business owing to ill-health, and to a fire which destroyed his freehold premises at Lancaster Road." He became aware of his position in August, 1930.

**T. Taylor,** electrician, 144, Littleton Road, Kersal, Lancs., late of Pendleton, Lancs.—This debtor's examination was resumed recently at the Court House, Salford. A statement of affairs had been lodged which showed ranking liabilities of £1,674, with assets of £64, leaving a deficiency of £1,610. The failure was attributed to "inability to obtain permanent business premises, insufficient turnover, and keen competition." The hearing was concluded.

**J. Vigon** (trading as Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road, E.—The statutory first meeting of creditors was held last week at London Bankruptcy Buildings before Mr. F. Vyvyan, Official Receiver. The debtor has lodged accounts showing liabilities of £1,965, against assets of £1,142. The failure was attributed to loss by burglary, bad debts, under-estimating contracts, and to having to take back into stock machines let out on hire. A resolution was passed for Mr. E. H. Hawkins to act as trustee of the estate.



**The new 15,000-kW turbo-generator set which will be started up at the Prince Rock Station, Plymouth, next Tuesday by Sir Andrew Duncan**

**A. de Villiers** (Castle Radio Manufacturing Co.), wireless and electrical manufacturer and dealer, 161, Westminster Bridge Road, S.E.—Receiving order made April 22nd on a creditor's petition. Public examination July 13th at Bankruptcy Buildings, Carey Street, W.C.

**F. W. T. Layton and R. E. Mills** (East Anglian Wireless Co.), Hamilton Road, Felixstowe.—First meeting May 6th at the Official Receiver's office, 9, Arcade Street, Ipswich. Public examination May 13th at the Shirehall, St. Helens Street, Ipswich.

**A. Robson** (Anson Radio), 147, Dickinson Road, Rusholme, Manchester.—Receiving order made April 26th on debtor's own petition.

**C. A. Brown,** wireless and electrical engineer, 36, Leagrave Road, Luton.—Trustee, Mr. S. P. Booth, 14, Holborn Viaduct, E.C., appointed April 21st.

**F. W. Hodges,** electrical engineer, 9a, Station Hill, Kidderminster.—First and final dividend of 4s. 2½d. in the £, payable May 2nd at the Official Receiver's office, 1, Priory Street, Dudley.

**B. T. Monier-Williams,** electrical engineer, Bungalow River Bank, Shoreham-by-Sea.—The receiving order made on January 15th last has been rescinded as a sufficient sum has been paid to the Official Receiver for payment of the costs, fees, and expenses of the bankruptcy, and of the debts in full.

## Company Liquidations

**A. E. Collier & Co., Ltd.,** electrical contractors and wireless engineers, 4, Anchor Street, Southport.—The statutory meeting of creditors was held recently at the offices of Messrs. Davies and Crane, Hoghton Street, Southport, when a statement of affairs was submitted, which disclosed liabilities of £876, of which £677 was due to trade creditors. The total assets amounted to £354, from which had to be deducted £23 for preferential claims, leaving net assets of £331, or a deficiency of £545. Mr. J. A. Bond was appointed liquidator.

**Pembrokeshire Electrical Power & Distribution Co., Ltd.**—Winding up voluntarily. Liquidator, Mr. L. S. Findlay, 35, Windsor Place, Cardiff. Particulars of claims by May 10th to the liquidator.

**R. Roberts, Ltd.**—Meeting May 30th, at Union Chambers, 63, Temple Row, Birmingham, to receive an account of the winding-up by the liquidator, Mr. S. T. Howle.

**Beam Sign Co., Ltd.**—Particulars of claims by May 14th to the liquidator, Mr. T. D. Hawkin, 1, Mitre Court Buildings, Temple, E.C.

**Priestley Patents, Ltd.**—Winding up voluntarily.

# Electricity Supply

## Lighting, Domestic, Power

**Aberdeen.**—EXTENSIONS.—The Electricity Committee has decided to extend mains to Kirkton Maryculter. An a.c. supply is also to be given to Kittybrewster.

**Arthington (Leeds).**—POSSIBILITY OF A SUPPLY.—As a result of negotiations extending over a period of two years it is probable that a supply of electricity will shortly be made available for the village.

**Australia.**—MELBOURNE.—The municipal electricity undertaking reports revenue totalling £546,154 for the past year, a decrease of £42,587 as compared with 1930, while the electricity sold declined by 6.87 per cent. General expenditure amounted to £306,117, which is £35,627 less, and largely offsets the decrease in revenue. Capital expenditure was increased by £77,878 to £2,800,858. A contribution of £45,000 was made to the Town Fund, after provision had been made for sinking fund on outstanding loans and contingency reserve.

**Barrow-in-Furness.**—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £5,000 for switchgear and protective apparatus.

SUPPLY TO SWARTHMOOR.—Mains extensions are to be carried out at a cost of £610 to give a supply to Swarthmoor.

**Bedwellty (Mon).**—AN ALL-ELECTRIC HOUSE.—In conjunction with the British Electrical Development Association the Urban District Council has opened an all-electric demonstration house at Blackwood.

**Birmingham.** — ELECTRICITY DEPARTMENT'S PROGRESS.—At a recent meeting of the Electricity Supply Committee it was stated that 780 additional consumers were connected during March. Comparing the totals with five years ago it appears that 71,640 additional premises are to-day receiving supplies of electricity, representing an increase during the five-year period of over 150 per cent. The sales of electricity during the March quarter show an increase of nearly 12 per cent. as compared with March, 1931. Taking the financial year as a whole, the total quantity sold amounted to 388,750,000 kWh, which is an advance of 8 per cent. compared with the previous year, against an average of between 5 per cent. and 6 per cent. for the country as a whole. The sales for the year, in comparison with the annual sales five years ago, show an increase of 66 per cent.

**Bognor Regis.**—EXTENSIONS.—The electricity scheme for the parish of Walberton, which includes part of Fontwell and Avisford Park, was completed last week. Underground cables have been used for the e.h.p. system and overhead lines for the l.p. system as far as possible.

**Brighton.**—POSSIBILITY OF NEW PLANT.—The Electricity Committee has received a letter from the Central Electricity Board to the effect that it is prepared to approach the Electricity Commissioners with a view to obtaining permission for the Corporation to install a 30,000-kW set at its power station, together with a corresponding capacity of boiler plant.

**Canada.**—DEVELOPMENT IN MONTREAL.—The Montreal City Council has approved a by-law providing for the borrowing of $5,000,000, in order to carry on the work of the Electrical Commission of Montreal. The work of this Commission, which has been in progress for upwards of ten years, is the provision of underground conduits through which pass all wires which were formerly strung on poles, the removal of which was found necessary in large central sections of the city.

**Chester.**—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to loans of £20,000 for mains and services and £5,000 for sub-stations and equipment in rural areas.

**Continental.**—FRANCE.—The report for 1931 of the Union des Syndicats de l'Electricité states that electricity is now available in 28,174 villages throughout France, or about 74 per cent. of the total number, and an increase of 58 per cent. since 1919. About 90 per cent of the country's population now enjoys electric service.

**Coventry.**—GROWTH OF ELECTRICITY UNDERTAKING.—Interesting information concerning the growth of the Corporation electricity undertaking is contained in the Coventry Municipal Handbook for 1932, just issued. The original area of supply, in 1891, was the city, which, it is pointed out, was then 3,093 acres. To-day the area of supply comprises about 61 sq. miles. The cost of production per kWh at Coventry has for many years been among the lowest in the country. A considerable proportion of the total energy is taken by consumers on the bulk supply system. The generating capacity of the undertaking is now 64,000 kW, and the number of consumers 27,841. The total cost per kWh has fallen to 0.89d., and with the exception of a loss of £16,632 in 1927 the undertaking has made handsome profits consistently since 1906. The profit for 1931 was £13,807.

**Distington (Cumberland).**—PARTICULARS OF SUPPLY.—A canvass of the village having been successful, the Mid-Cumberland Electricity Supply Co. is to extend the supply from Harrington. The proposed charges are 7d. per kWh for lighting, and 2d. for heating, with a two-part tariff. Installation work under an assisted wiring scheme will probably be let out to local contractors, consumers paying 1s. 3d. per light per quarter over a period of five years for installation costs. The question of adopting electricity for public lighting has been referred to a parish meeting.

**Dunoon.**—FLOODLIGHTING.—The Town Council is considering the purchase of floodlighting equipment.

**Eastbourne.**—EXTENSIONS.—The Electricity Committee is applying for sanction to a loan of £10,660 for extensions.

**Eccles.**—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve the supply in three areas at a cost of £5,500.

**Falkirk.**—INQUIRY.—Mr. H. Nimmo is to hold an inquiry on behalf of the Electricity Commissioners into an application of the Corporation for permission to install a 5,000-kW turbo-generator at its power station.

**Gillingham (Kent).**—REDUCED CHARGES.—The Town Council has reduced its charges for electricity as follows:—Motive power: 1½d. per kWh. Domestic tariff: 15 per cent. of the net rateable value per annum, plus ¾d. per kWh, with no meter rents. Special domestic tariff: 15 per cent of the net rateable value per annum, plus ½d. per kWh where cookers or hot water systems are installed, with no meter rent.

**Glasgow.**—ARBITRATION RESULT.—With regard to the arbitration proceedings in connection with the termination of the agreement with the Clyde Valley Electrical Power Co., Ltd., for the supply of electricity in the Shettleston and Tollcross area, the town clerk reports that the arbitrator has issued his proposed findings to the effect that the claimants, the Clyde Valley Co., have not suffered an actual loss in the working of the agreement. He therefore proposes to refuse the claim for an extension of the agreement and to find the claimants liable for the expenses of the arbitration.

PROGRESS DURING MARCH.—Under the Electricity Department's scheme 166 houses were wired in March, making the total to date 35,462, while hired appliances installed numbered 16, bringing the total to 20,438.

MAINS EXTENSIONS.—The Electricity Committee recommends the laying of distributing mains at a cost of £8,454.

**Guildford.**—CHANGE-OVER.—In order to meet increasingly heavy demands for electricity in the centre of the town it is proposed to change over the supply in certain districts to a.c. The work would be spread over a period of twelve months, the total cost being £8,930.

**Holme Cultram (Cumberland).**—NO SUPPLY YET.—The Urban District Council has been informed by the Mid-Cumberland Electricity Co., Ltd., that it will be some months before work is commenced on the electricity scheme for the village.

**Irish Free State.**—DUBLIN.—The Corporation proposes to spend several thousand pounds on the floodlighting of buildings in connection with the Eucharistic Congress this summer.

WICKLOW.—The Urban District Council has rescinded a resolution to light the town by gas and has accepted the tender of the Electricity Supply Board for a period of one year.

**Japan.**—HYDRO-ELECTRIC SCHEME.—The Yahagi Hydro-Electric Co. is considering the development of 52,000 kW on the Tenryu River. If the company decides in favour of the scheme, work will be commenced about next June and completed towards the end of 1934. The estimated cost is 11,000,000 yen.

**Keighley.**—MAINS AND SERVICES.—The Electricity Committee has received sanction to a loan of £40,000 for expenditure on mains and services.

**Kettering.**—ELECTRICITY FOR ISHAM.—The Electricity Committee has agreed to provide an electricity supply to the Isham Parish Council, subject to a guarantee of 15 per cent. return on the capital expenditure, estimated at £1,211, for a minimum period of five years.

**Leeds.**—ELECTRICITY PREFERRED.—The Improvements Committee has received an application from the tenants of the "all gas" houses on the Meanwood Housing Estate for consent to the electric wiring of the houses for lighting purposes under the assisted wiring scheme. Permission has been given.

METERS.—The Electricity Committee has decided to purchase a further 1,000 prepayment meters.

LOAN SANCTIONED.—Sanction has been received to the borrowing of £30,000 for house wiring installations.

**London.**—HAMMERSMITH.—To maintain the pressure of supply in the Letchford Gardens area the Electricity Committee proposes to provide a ring-main at a cost of £1,198.

**Macclesfield.**—THE ELECTRICITY QUESTION.—The Electricity Committee has decided not to consider the overtures of the electricity company until it receives details of the prices which the company will charge in the event of the Council's agreeing to withdraw its resolution to exercise its option to purchase the undertaking. It is considered that the offer put forward by the company has not gone far enough to satisfy the Electricity Commissioners, who gave the company until May 2nd to state more explicitly the extent to which it would be prepared to go if the Corporation extended the company's tenure for a further 21 years.

**Maidenhead.**—ASSISTED WIRING.—The borough electrical engineer has prepared a scheme for providing electrical installations in small houses on the hire-purchase system, and the Electricity Committee is consulting the Housing Committee on the matter.

**Maidstone.**—EXTENSIONS.—The Town Council is to extend its supply to the Coxheath area, the estimated cost of mains, switchgear, transformer, &c., being £2,400.

**Morecambe.**—MAINS AND SERVICES.—The Electricity Committee is to apply for sanction to a loan of £10,000 for extension of mains and services.

LIGHTING OF BUS STATION.—The Watch Committee has asked the electrical engineer to submit alternative schemes for the more economical lighting of the omnibus station.

**Norfolk.**—ELECTRICAL DEVELOPMENT.—Approximately £100,000 will be spent this year by the East Anglian Electric Supply Co., Ltd., on developments. Provision is being made for the extension of the supply from Hunstanton to Wells (including the villages between), Fakenham, and later to Swaffham.

**Northern Ireland.**—PROPOSED DEVELOPMENT OF THE ERNE.—A proposal to develop electricity from the Erne is to be considered by the Fermanagh County Council.

**Plymouth.**—CABLE EXTENSIONS.—The Electricity Committee has approved cable extensions in ten streets costing approximately £1,000.

INAUGURATION OF NEW GENERATOR.—Sir Andrew R. Duncan, chairman of the Central Electricity Board, is to start up the new 15,000-kW turbo-generator set at the Prince Rock power station on May 10th. A picture of the set appears on p. 682.

**Rawtenstall.**—NEW SWITCHGEAR.—The Town Council has decided to apply for sanction to a loan of £26,250 for new switchgear for the electricity works and sub-stations in the borough.

**Scarborough.**—PUBLIC LIGHTING IMPROVEMENTS.—The Town Council has decided, after exhaustive tests, to replace the present high power gas lighting in the chief streets by 1,000-W electric lamps. The change applies to the town's main street from the junction of Falsgrave & Scalby Roads to the bottom of Eastborough (at the Harbour); along Sandside to the Marine Drive; along the South Shore sea-front; and in Aberdeen Walk.

**Skegness.**—INAUGURATION CEREMONY.—As mentioned in our last issue, a supply of electricity from the Mid-Lincs Electric Supply Co. was inaugurated on April 23rd. The twenty-four miles of overhead line from Boston were erected by W. T. Henley's Telegraph Works Co., Ltd., the Skegness section being the initial portion of an electrification scheme under which a large area of Lincolnshire will receive an electricity supply. The accompanying illustration shows the company present at the inauguration ceremony; it includes Mr. J. Crawshaw (centre), chairman of the Urban District Council, Mr. H. Haslam (left), M.P. for the Skegness division, Mr. L. Giacomizzi (right), manager of the Supply Co., and Mr. B. Langfield, Henley's engineer in charge of the contract. A luncheon will be held at Skegness next Thursday, May 12th, to celebrate the inauguration of the supply. Mr. R. Borlase Matthews, the promoter of the Special Order for this area, will speak on "Rural Electrification."

**The inauguration ceremony at Skegness**

**Slough.**—REDUCED CHARGES.—The Slough and Datchet Electric Supply Co., Ltd., has reduced its lighting flat rate from 6½d. to 6d. per kWh.

**Weston-super-Mare.**—CHEAPER ELECTRICITY.—The Weston-super-Mare and District Electric Supply Co. announces a reduction in the charge for electricity for lighting from 6½d. to 6d. per kWh for the first 100 kWh per quarter, and from 5½d. to 5d. for all subsequent energy. The prices in Uphill and district will be correspondingly reduced by ½d. to 5½d. and 6d. respectively.

# Traction

**Brazil.**—REORGANISATION OF RAILWAY.—The Companhia Paulista de Vias Ferreas e Fluviaes has contracted with the São Paulo State to lease the Noroeste Railway, 1,273 km. in length. The company will also devote 10,000 contos of reis to the re-equipment and reorganisation of the line. For these purposes it is proposed to increase the company's capital from 300,000 to 350,000 contos, the bulk of the increase being spent on new rolling stock and material. Ten years ago the company electrified part of its main line and three subsequent extensions were made, bringing the electrified zone up to over 180 miles. The number of electric locomotives has now been increased to 25. The d.c. overhead system of electrification at 3,000 V is employed.—*Reuter's Trade Service* (São Paulo).

**Continental.**—FRANCE.—Further progress has been made, says *Reuter's Trade Service*, with the electrification of the Midi railway system in the south-west of France. At December 31st last 1,361 km. of line had been electrified, and in 1931 electric traction was introduced on two railway lines with a total length of 190 km.—one from Cambo to Saint-Jean-Pied-de-Port and Saint-Etienne-de-Baigorry, 42 km. in length, and the other from Béziers to Séverac, 148 km. This year the whole of the line from Béziers to Neussargues will be electrified, and a start will be made with the electrification of the important section from Montauban to Sète and probably the railway from Bordeaux to Pointe-de-Grave. Diesel engine-driven railcars made of duralumin, and having a speed of 90 km. p.h., are eventually to replace the existing slow and costly passenger trains on the secondary lines, and the company is now making preparations for the introduction of eleven of these railcars on 350 km. of line around Mont-de-Marsan.

ITALY.—The electrification of the railway operating between Parma and La Spezzia—the last stage of the line linking up the Brenner Pass with the Mediterranean—is now completed. Trains will in future take 45 minutes less between Parma and La Spezzia than formerly. The total cost of the electrification and strengthening of the line for the increased traffic which is anticipated has amounted to 95 million lire (over £1,000,000 at par).—*Reuter* (Rome).

**London.**—TRAMWAY ESTIMATES.—At a meeting of the London County Council on Monday the Highways Committee submitted the annual estimates for the tramway undertaking for the year 1932-33. It is estimated that the total receipts will amount to £4,290,835, and that the gross working expenses, including renewal and special charges, will be £3,569,230, leaving a gross profit of £721,605. After deducting the net loan charges there will be an estimated net surplus of £1,420. The approximate results for the year 1931-32 were: Total receipts, £4,135,500; gross profit, £638,500; net deficiency, £115,000; car mileage, 70,244,579; passengers carried 692,500,000. Adverse weather conditions and trade depression, accentuated by the general financial crisis in the autumn, are stated to have been responsible for the decline in receipts.

**L.M.S. Railway.**—MAIN LINE ELECTRIFICATION.—According to the *Manchester Guardian*, the London, Midland and Scottish Railway is considering schemes for the electrification of the main line from London to Carlisle, with branch sections to Birmingham, and branches in the North, including the line from Manchester (Victoria) to Blackpool. Statistics are being prepared with a view to ascertaining the possible saving accruing from a change-over to electricity.

**Manchester.**—BUSES TO REPLACE TRAMS.—The Transport Committee has decided to substitute buses on the Manchester-Rochdale tram route. The alternative is the renewal of track at a cost of £42,640. At Rochdale all the trams have now been superseded by buses except upon the Whitworth, Heywood, and Milnrow routes, which will be abandoned in the near future. Joint conferences have already been held between the Rochdale, Heywood and Bury Corporations on the question.

RELIEVING TRAFFIC CONGESTION.—A one-way system for trams has been put into operation in Manchester as an attempt to alleviate congestion in certain areas near Piccadilly.

**Traffic Signals.**—NEW INSTALLATIONS.—It is proposed to install automatic traffic signals at Poplar (£500); North Bridge Street, Sunderland; Gainsborough; and Kidderminster.

# Communications

**Belgium.**—RADIO COMMISSION.—The recently appointed Broadcasting Commission met for the first time on April 26th. It is to inquire into the position of private transmitting stations, of which there are at present 23, while over 150 applications for transmitting licences are pending.

**Canada.**—RADIO SET SALES.—The number of radio receivers sold during 1931 reached 266,122, valued at $18,141,347. According to *World-Radio* the corresponding figures for 1930 were 223,228 and $22,776,225.

**China.**—RADIO-TELEGRAPH STATION.—The Minister of Communications announces that preparations for the erection of a new powerful Chinese radio station capable of communicating with any station in the world are being made by the Government.—*Reuter* (Nanking).

**France.**—NEW BROADCASTING STATIONS.—Land has been bought at Thourie in the department of Ille-et-Vilaine for the purpose of building a broadcasting station for western France. The plans and estimates have been forwarded to the Minister of Public Works, who is said to have given the scheme a favourable reception.—*Reuter's Trade Service* (Rennes).

The official opening of the new plant of the "Poste Parisien" recently took place at the studio in Paris. The Minister of postal and telegraph services presided, and in the course of his speech remarked that owing to the lack of legal status broadcasting in France had not been able to develop as quickly as was hoped. He thought it was imperative that the next Parliament should pass a Bill fixing the rights and obligations of broadcasting enterprises. The new station is at Molières, 30 km. from Paris. It will broadcast on a wavelength of 328 metres with a power of 60 kW. Private cables 35 km. long link the station with the studio in Paris, which has an installation that will enable the studio eventually to provide television.—*Reuter's Trade Service* (Paris).

**Great Britain.**—RADIO EXCHANGES.—Beccles Town Council has decided to take no action with respect to an application by Broadcast Listeners' Services, Ltd., for permission to establish a relay service for the borough.

Darlington Town Council has referred applications to a committee for consideration and report. A year ago similar applications were deferred principally on the ground that the Streets Committee was not satisfied that the apparatus was sufficiently developed.

There are now about 120 of these relay stations operating in various parts of the country. They work under a Post Office licence, which allows them to select the programme to be broadcast from any existing transmitting station, either British or foreign, but expressly forbids them to originate programmes of their own. Several relay stations have, however, been departing from the terms of their licences by including in their transmissions items which do not figure in the ordinary broadcast programmes. The *Daily Telegraph* understands that steps have been taken to prevent a recurrence of these infringements, and an official intimation has been given that if the warning is disregarded it may lead to licences being rescinded.

**Italy.**—INCREASED LICENCE FEE.—The broadcast radio receiver licence fee has been increased from 75 to 80 lire per annum, or 84 lire if paid half-yearly. The increased revenue is to be used for subsidising theatrical performances.

**London.**—SCHOOL RADIO RECEIVERS.—The Central Council for School Broadcasting, representing the central and local education authorities and teachers, has decided to advise education authorities and schools to install only such wireless receiving apparatus as has been approved by the Council. Approval is given as a result of a demonstration of apparatus (receiving sets, loud speakers, and complete installations) arranged by the Council (as far as possible under class room conditions). A guarantee is also required that the apparatus conforms to certain requirements of design and performance. Manufacturers, if they so desire, can, in addition, arrange with the National Physical Laboratory to apply certain special tests. The Council proposes to issue shortly to all education authorities for circulation to schools and for publication in gazettes a list of the names and addresses of makers of apparatus (with details) approved by the Council. Special attention will be drawn in the list to those makers whose apparatus has been tested at the N.P.L. Makers of wireless receiving apparatus desiring to have their names included in the Council's lists should apply for further information to the secretary of the Council, Broadcasting House, London, W.1.

A TELEVISION DEMONSTRATION.—In a small room on the roof of Messrs. Selfridge's store in Oxford Street (which at one time housed the old 2LO transmitter of the B.B.C.) on Tuesday last Mr. J. L. Baird demonstrated the progress which he has made with his system of television. His company has recently been granted a short-wave transmitting licence, which enables him to radiate programmes independently of the ordinary broadcasting arrangements. For the purpose of the demonstration transmission took place from the Baird studio in Long Acre, Covent Garden, first via the B.B.C. and then direct (vision only) on a wavelength of 6.1 metres. Instead of the usual lens, the receiving "Televisor" had a screen about 12 in. in height and 4 in. wide. Some twenty people in the room were thus able to see collectively the artists, who included a dancer and a cartoonist.

**Newcastle-upon-Tyne.**—SHIP-SHORE TELEPHONY.—A loss of £35 was recorded on the Tyne Improvement Commission's ship-to-shore telephone system for the past year. It was stated that if a loss were still shown at the end of this year the charge would probably be raised from 2s. daily to 3s.

**New Zealand.**—CLOSING OF CABLE OFFICE.—The Wellington office of Imperial and International Communications, Ltd., is being closed in order to obtain more economical working of the cable services. The Sydney-Wellington cable service will now be operated from Auckland.

**South Africa.**—DURBAN'S TELEPHONES.—A deputation from the Durban Corporation has visited Cape Town to discuss with the Minister of Posts and Telegraphs difficulties arising from the Government's reversal of its decision to purchase the Durban municipal telephone system. The Town Council claims compensation for the heavy expenses of preparing the expropriation assessment. It is also anxious about the financial situation, as, in expectation of a lump sum for the telephones, it has notified its intention to redeem the municipal loan of £500,000 which is shortly due for repayment.

# Contract Information

*When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below*

## Contracts Open

**Australia.**—MELBOURNE.—May 31st. Post and Telegraph Department. Electrical testing apparatus. (A.X. 11332.)*

**Belgium.**—LIEGE.—May 15th. Société Anonyme des Tramways Unifiés de Liége et Extensions. Trolley buses. (G.X. 11389.)*

IXELLES.—May 11th. Administration Communale. H.p. and l.p. armoured cable. Particulars (Cahier des Charges), from Service de l'Electricité, 20, Rue d'Alsace-Lorraine, Ixelles, Brussels.

**Cardiff.**—May 25th. Electricity Department. E.h.p. and l.p. cables. (See this issue.)

**Cheadle and Gatley.**—May 10th. Electricity Department. 6,600-V truck type control cubicle and a medium pressure stationary type ironclad unit. (April 22nd.)

**Cheffing Wycombe.**—May 23rd. Town Council. Electrically driven pumping plant for Pann Mill waterworks. Mr. W. Vaux Graham, 5, Queen Anne's Gate, S.W.1 (deposit, £5).

**Darlington.**—Town Council. Electric lighting installation at the public baths, Kendrew Street. Mr. E. Minors, borough engineer, Town Hall.

**Dumfries.**—May 7th. County Council. 11,000-V truck type switchboard for Gretna sub-station. (April 22nd.)
May 21st. Twelve kiosks. (See this issue.)

**East Lothian.**—May 14th. County Council. Various works, including electric lighting, at new police station, North Berwick. Messrs. Dick, Peddie & Walker Todd, 8, Albyn Place, Edinburgh (deposit £2 2s.).

**Glasgow.**—May 11th. Education Department. Electrical work at Springfield Road Advanced Central School. Education Office, 129, Bath Street (deposit £1 1s.).
May 23rd. Electricity Department. Cables, flexibles, cookers, kettles and cable covering tiles. (See this issue.)

**Greece.**—ATHENS.—June 1st. Greek State Railways. Diesel or Diesel-electric standard gauge rail coaches. (G. 11410.)*

**India.**—SIMLA.—Indian Stores Department. Wall plugs and ceiling roses. (A.X. 11340.)*

**Lithuania.**—KOVNO.—May 13th. Posts, Telegraphs and Telephones Administration. Telephone material. (A.X. 11336.)*

**Manchester.**—May 7th. Rivers Committee. Electrical pumping plant for Davyhulme sewage works, Urmston. Secretary, Corporation Rivers Dept., Ship Canal House, King Street.

**Middlesbrough.**—May 12th. Electricity Department. Cables and meters. (April 22nd.)

**Milngavie.**—Town Council. Electric lighting installation in 68 houses. Mr. F. A. B. Preston, architect, 6, Buchanan Street (deposit, £1 1s.).

**New Zealand.**—WELLINGTON.—June 7th. Post and Telegraph Department. Magneto bells. (A. 11331.)*
June 22nd. Insulators. (A.X. 11335.)*

**Northern Ireland.**—BELFAST.—May 17th. Tramway Department. 500-kW rotary convertor. (See this issue.)

**South Africa.**—JOHANNESBURG.—May 26th. City Council. Transformers (A.X. 11329) and traction lamps (A.X. 11330.)*

**Southend-on-Sea.**—May 19th. Corporation. Traffic control signals. (See this issue.)

**Tilbury.**—May 30th. Urban District Council. E.h.p. and l.p. cables, switchgear and kiosks (See this issue.)

**Uruguay.**—MONTEVIDEO.—July 11th. National Administration of the Port. Electrically operated goods lifts and cranes. (A.X. 11338.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

## Contracts Closed

**Armadale.**—Town Council. Accepted. Electrical fittings for the Town Hall.—J. Bryce.

**Barking and Ilford.**—Joint Sewerage Committee. Recommended. Stand-by generating plant (£6,931).—Davey, Paxman & Co., Ltd. Transformers and switchgear (£872).—Standard Switchgear, Ltd.

**Birkenhead.**—Electricity Committee. Accepted. Switchgear (£1,718).—Switchgear & Cowans, Ltd. Cable (£622).—Hackbridge Cable Co., Ltd.

**Birmingham.**—Education Committee. Accepted. Electric lighting installation at St. Benedict's Road School (£361).—Gordon Hughes Electrical Co., Ltd.

**Eastbourne.**—Electricity Committee. Accepted. Ten transformers (£943).—British Electric Transformer Co., Ltd. Switchgear (£2,209).—General Electric Co., Ltd.

**Glasgow.**—Corporation Libraries Committee. Accepted. Installation of intercommunication telephones in the Gorbals new district library.—Standard Telephones & Cables, Ltd.

**Great Crosby.**—Urban District Council. Accepted. Supply of electric lamps for one year.—Metropolitan-Vickers Electrical Co., Ltd.

**Hull.**—Telephones Committee. Accepted. Private automatic exchanges (£960).—Standard Telephones & Cables, Ltd. Switchboards (£45).—Ericsson Telephones, Ltd. Inside wire (£80).—Ward & Goldstone, Ltd.

**Ilford.**—Electricity Committee. Recommended. Rectifier plant, Clark's Road sub-station (£2,795).—Whipp & Bourne. 500-kW rotary convertor and automatic switchgear for dust-destructor sub-station (£1,810).—Crompton Parkinson, Ltd. 1,500-kW rectifier and automatic switchgear for new sub-station near centre of town (£5,383, plus £250 for increased size of transformer to 1,500 kW).—General Electric Co., Ltd.

**Kidderminster.**—Drainage and Water Committee. Recommended. Installation of electrical pumping plant (£785).—Rees Roturbo Co., Ltd.

**London.**—L.C.C.—Highways Committee. Accepted. Electrodes.—Quasi-Arc Co., Ltd. Education Committee. Accepted. Electric wiring and fittings at Newington junior school (Pastor's College), Southwark (£504).—T. Clarke & Co., Ltd.
HAMMERSMITH. — Electricity Committee. Recommended. Rising mains in Guinness Trust Buildings (£450).—Wilkins Electrical Works, Ltd.

**Manchester.**—Electricity Committee. Accepted. Voltage variation equipment.—Fuller Electrical & Manufacturing Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd. Boiler and boiler-house vacuum cleaning plant.—British Vacuum Cleaner & Engineering Co., Ltd. Three sub-station kiosks.—Crompton Parkinson, Ltd.
Education Committee. Accepted. Electrical alterations and additions at Stanley Grove council school.—R. Seddon & Sons. Electrical works at Hague Street council school.—S. H. Heywood & Co., Ltd. Electrical installation at Old Moat senior school.—E. M. Evans & Son, Ltd. Electrical installation at Ladybarn senior school.—S. H. Heywood & Co., Ltd.

**Sheffield.**—Transport Committee. Recommended. Twenty-four traction resistances.—British Thomson-Houston Co., Ltd. Twenty-two car sets of control and braking system.—Maley & Taunton, Ltd.

**Swadlincote.**—Urban District Council. Accepted. Installation of inter-departmental telephones (£61).—Gent & Co.

## Forthcoming Events

**Royal Institution.**—Friday, May 6th. Institution, London. 8.30 p.m. Conversazione. Friday, May 13th. 9 p.m. "Broadcasting." Sir John C. W. Reith.

**Institution of Electrical Engineers.**—(*London Students' Section*).—Monday, May 9th. Institution, London. 6.15 p.m. Annual general meeting. (*South Midland Students' Section*).—Tuesday, May 10th. University, Birmingham. 7 p.m. Annual general meeting. "Modern Developments in Protective Gear for 3-phase Lines and Feeders." Mr. D. J. Pearce. (*Hampshire Sub-Centre*).—Wednesday, May 11th. University College, Southampton. 7.30 p.m. "The Metering of Three-phase Supplies." Mr. O. Howarth. (*Tees-Side Sub-Centre*).—Wednesday, May 11th. Cleveland Technical Institute, Middlesbrough. 7 p.m. Annual general meeting. (*Scottish Centre*).—Friday, May 13th. Cowdray Hall, Aberdeen. 7.30 p.m. Faraday lecture. "Everyday Uses of Electricity." Prof. J. K. Catterson-Smith.

**Institution of Civil Engineers.**—Tuesday, May 10th. Institution, London. 6 p.m. Annual general meeting.

**Television Society.**—Wednesday, May 11th. University College, Gower Street, W.C. 7 p.m. "Seven Years' Experimental Research and Investigation in Television." Mr. R. W. Corkling.

**Institute of Metals.**—Wednesday, May 11th. Institute, London. 8 p.m. May lecture. "The Plastic Deformation of Metals." Prof. Dr. F. Körber.

## Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

MARVEL electric bread cutter.
BIRMACO electric iron.
NOVALUX lamps.
ELLANETTE immersion heater.
SHELTON violet-ray outfit.
HART anti-fraying compound for ropes.

### The Grid's Ultimate Effect

IN the course of a lecture at Stockton on April 29th, Mr. D. Maxwell Buist, North-East Area officer of the Central Electricity Board, stated that the value of the grid scheme could not be measured by economics, but by the ultimate effect it would have on the national life. The great national service which was aimed at would place Great Britain in a higher place in world industrial development than it had ever occupied before. Other countries were already seeking first-hand information about the organisation.

In June they hoped to have a ceremony at York which would link up the Thames with the Tyne. Substantial over-all economies in generating costs, as well as the opening up of new territory, would result when the scheme was in full operation. Rural electrification might tempt industries to leave congested areas, where rates were high, and educate farmers to the realisation of how their industry might be made prosperous by the more general employment of electrical power.

A special feature of the Tees-side area was that the four-way 132,000-V switching station at Norton-on-Tees, interconnecting York, Newcastle, Darlington, and North Tees, was the second largest in the country.

# Notes

## I.E.E. Summer Meeting

For the convenience of members who are unable to take part in the whole of the week's summer meeting of the Institution of Electrical Engineers (Harrogate, May 30th to June 3rd) it has been arranged to accept entries for single days from members of the North Midland Centre (Leeds) and Sheffield Sub-Centre at one guinea per day inclusive of the evening function. Members wishing to attend only the evening functions can do so on payment of 5s. per head per day. Applications should be made to headquarters, I.E.E., Savoy Place, W.C.2, as soon as possible.

## O.L.A. Summer Meeting

The one-day summer meeting of the Overhead Lines Association will be held at Chesham on July 1st at the invitation of the Chesham Electric Light & Power Co., Ltd., whose engineer, Mr. Jocelyn Swan, is president of the Association. Motor coaches will meet members at Chesham railway station and take them on a tour of the company's southern area before luncheon at the Town Hall, Chesham. In the afternoon the northern area will be inspected, and there will be a short visit to Ashridge House and gardens before tea at Little Gaddesden.

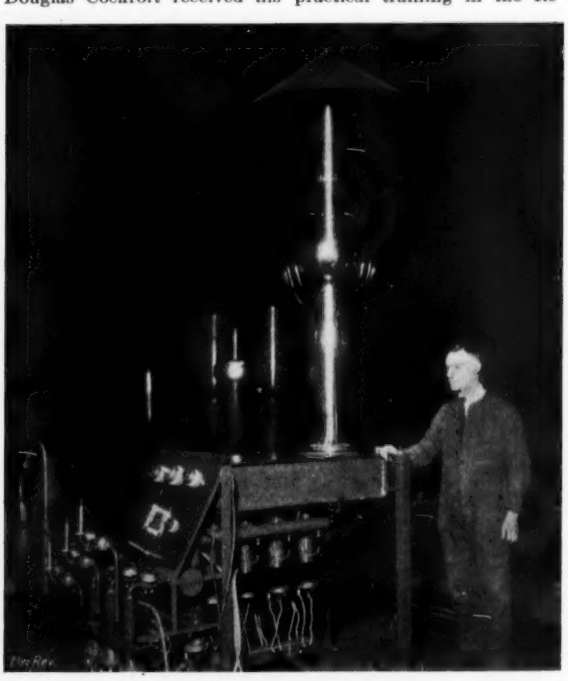
Applications should be sent to Mr. G. W. Molle, hon. secretary, 44, Devonshire Chambers, 146, Bishopsgate, E.C.2. If there are sufficient entries, a golf competition will be arranged at Ashridge or Berkhampstead by Mr. J. H. C. Brooking, Croydon Cable Works, Ltd., Mitcham Road, Croydon.

## The Swan Memorial

The fund which has been raised for the purpose of founding Swan Memorial scholarships in electrical science in memory of Sir Joseph Wilson Swan, inventor of the electric incandescent lamp, amounts to nearly £3,000. A meeting of the committee was held on April 26th in the Town Hall, Sunderland, the town of Swan's birth, when it was decided to close the fund on May 9th, and the committee hopes that a total of £3,000 will be realised on or before that date. Many appeals have been circulated, the majority of which were posted to individuals engaged in the electrical industry, members of the Institution of Electrical Engineers, and members of the Royal Photographic Society of Great Britain. Those who have promised or intend to subscribe to the fund should forward their donations, as soon as possible, to Mr. E. T. Nicholson, Martins Bank, Fawcett Street, Sunderland, or Mr. P. F. Rowell, I.E.E., Victoria Embankment, W.C.2.

## "Splitting the Atom"

We refer to the achievements of Dr. J. D. Cockroft and Dr. E. T. Walton in our leading columns to-day. Dr. John Douglas Cockroft received his practical training in the Research Department of the Metropolitan-Vickers Electrical Co., Ltd., from 1920-1922, after graduation in engineering at Manchester University. He then undertook further academic work at Cambridge before entering on his present research work in the Cavendish Laboratory under the direction of Professor Lord Rutherford.



**The atom-splitting apparatus**

Dr. Cockroft has maintained close personal touch with the Metropolitan-Vickers Research Department and has availed himself readily of all the advances in laboratory technique which have been made there during the last few years. He has embodied in his apparatus the latest practice on vacuum technique developed in these laboratories by Mr. C. R. Burch, involving the use of special vacuum pumps. The tube illustrated is similar in all essential features to that used in the experiments. He also used special oils and greases made only by the Research Department of the Metropolitan-Vickers Co. The high-voltage transformer used by Dr. Cockroft was also of M.-V. manufacture.

## Co-operation in North Wales

Nearly one hundred North Wales electrical and communication engineers met at Rhos Abbey Hotel, Colwyn Bay, last week, Mr. A. Hewitt, chairman of the North Wales and South Cheshire Joint Electricity Authority, presiding. The function was the first of its kind, and is to be repeated annually.

Mr. G. K. Paton (engineer and manager, North Wales Power Co.) said that in ten years the sales of his company had risen from 10 million to 65 million kWh—over six and a half times—and the number of consumers from 2,344 to 13,080. All the energy was generated by water power.

Mr. G. E. Barrett emphasised that the price of electricity had been reduced by one-half during eight years. Mr. Kelly (electrical engineer, Prestatyn) said that his undertaking supplied energy at the rate of 95 kWh per head of population with no industrial load. Other speakers were Mr. J. H. Watkins, P.O. Divisional Engineer; Mr. Crossley Colley and Mr. A. Taylor, both of the L.M.S. Railway; Mr. R. J. Cunninghame, P.O. engineer; and Mr. L. V. Lurring, North Wales Power Co.

## Appointments Vacant

Combustion assistant for Grimsby Electricity Department.

Assistant installation superintendent for Barking Electricity Department.

Meter mechanic for Perth Electricity Department.

(See our advertisement pages to-day.)

## Authorised Undertakings in Great Britain

The following table of separate authorised undertakings has been made up by extracting the figures given in the annual reports of the Electricity Commissioners.

| Year (at March 31st). | No. of Authorised Undertakings. | Net increase on previous year. |
|---|---|---|
| 1922 .. .. .. | 531 | — |
| 1923 .. .. .. | 541 | 10 |
| 1924 .. .. .. | 557 | 16 |
| 1925 .. .. .. | 565 | 8 |
| 1926 .. .. .. | 593 | 28 |
| 1927 .. .. .. | 623 | 30 |
| 1928 .. .. .. | 642 | 19 |
| 1929 .. .. .. | 659 | 17 |
| 1930 .. .. .. | 668 | 9 |

Possibly 668 will prove to be the "peak," as the tendency is for numbers of separate undertakings to be reduced by consolidation.

## Acquiring a Sub-station Site

As we go to press we have received a communication from a well-known borough electrical engineer in which he says that his department wished to acquire a site for a transformer sub-station. The property included unoccupied derelict buildings which had been condemned by the Borough Council. The fair market value of the site and buildings was £300 to £350, but they were asked £500 for them. The Council resolved to apply for compulsory powers, since when the property has been offered for £450. The Town Clerk reported that the Statutory Rules made by the Electricity Commissioners respecting applications for a Special Order for compulsory acquisition of land provided for (inter alia): (1) Publication of notice by advertisement (allowing thirty days for objection). (2) Service of notice of intended application upon (a) the owner, lessee and occupier of the land to be acquired; and (b) the owners or lessees of all lands or houses situate within 300 yards of the land to be acquired. (3) Printing of orders, notices, book of reference containing names of owners, lessees and occupiers of the land to be acquired and of all lands and houses within 300 yards. (4) Large scale maps of the whole area of supply and of land to be acquired. (5) Payment of £35 to the Electricity Commissioners (on deposit of documents) to cover ordinary expenses. Any additional expenses to be payable by the Corporation. (6) Deposit with Commissioners and also with the Clerk of the Peace of the county of Draft Order, advertisements, book of reference, and maps. (7) Formal compliance with the Acts and Rules to be proved by Parliamentary agents.

The Town Clerk considered that in this way the cost of obtaining a Special Order would not be much less than £100, while it might take anything up to six months to get an Order through, after which there would be arbitration upon the price to be paid.

Our correspondent considers that if the Government really desires the country to have a "cheap and abundant supply of electricity" it is high time that such "circumlocution office" methods were abolished.

## Batti-Wallahs' Luncheon

An address was given on Wednesday last at the Batti-Wallahs' Society luncheon by Sir Malcolm Campbell on his experiences during his various attempts to establish new speed records with his motor-car "Bluebird."

# Our Personal Column

**Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements**

**The Marchese Marconi** was presented with the 1932 Kelvin Medal at the Institution of Civil Engineers on Tuesday evening last. In our picture Lord Rutherford is seen making the presentation in the presence of the President of the Institution of Civil Engineers, Sir Cyril Kirkpatrick.

**Lord Rutherford presenting the Marchese Marconi with the Kelvin Medal**

**Mr. W. Ellerd-Styles** has resigned from the position of managing director of the Artofex Engineering Works, Ltd., a position which he has held since the formation of the company in 1920, and has now commenced business on his own account at Ceres House, 11-13, Pentonville Road, N.1. He asks for catalogues relating to electrical and mechanical engineering.

**Mr. H. G. Baker,** who recently left the Universal Electric Lamp Co., has been appointed accountant and manager to British Electrical Domestic Appliances, Ltd.

**Mr. W. S. Gearing,** recently of the London sales staff of Crompton Parkinson, Ltd., has resigned his position to join Mr. C. Reid, London representative of Whipp & Bourne, Ltd., and the Watford Electric & Manufacturing Co., Ltd.

**Sir Roland Nugent** has resigned from the post of director of the Federation of British Industries, a position which he has held since the inception of the Federation in 1916, owing to

*[Elliott and Fry.*

**Sir Roland Nugent, who is retiring from the position of director of the F.B.I., and his successor, Mr. Guy Locock.**

increasing pressure of private interests. The Federation will not entirely lose his services as he is to act in an advisory capacity.

**Mr. Guy Locock** has been appointed as acting director of the Federation. He has been assistant director for 14 years, and has for the last few years acted as deputy director.

**Mr. R. J. Walker, C.B.E.,** managing director of the Parsons Marine Steam Turbine Co., Ltd., Wallsend-on-Tyne, has been elected president of the North-East Coast Institution of Engineers and Shipbuilders. Mr. Walker was closely associated with the late Sir Charles A. Parsons for many years.

**Mr. W. Bannister** has been appointed managing director of Messrs. Coley & Swinnerton, Ltd., Wolverhampton, in place of Mr. J. R. Swinnerton, who has resigned. Mr. Bannister has been with the firm for eight years.

**Mr. Martin J. Insull,** president of the Mid-West Utilities Co., is reported to be retiring owing to ill-health. The company's affairs are now being directed by three receivers, one of whom is Mr. Samuel Insull.

**Councillor A. E. Jones** has been elected chairman of the Willesden Urban District Council Electricity Committee.

**Mr. John B. Morgan** has been appointed electrical engineer to the East Grinstead Urban District Council.

**Mr. G. E. Barrett,** of Electricity Distribution of North Wales and District, Ltd., is leaving the company to join the North Metropolitan Electric Power Supply Co.

**Prof. O. T. Jones, D.Sc., F.R.S.,** has been appointed a member of the Safety in Mines Research Board.

## Obituary

**Mr. F. M. Rogers.**—We regret to record the death of Mr. F. Massingberd Rogers, which occurred at 4, Albert Hall Mansions, London, on April 28th, in his 58th year. Mr. Rogers received his training at Bristol under Mr. Faraday Proctor. He was later connected with the British Westinghouse Co. as export manager and subsequently became European manager of the Westinghouse Electric International Company. He was appointed managing director of the Greater London and Counties Trust, which was formed in 1926, with a capital of £10,000, and succeeded the late Lord Birkenhead as chairman in 1930. Others associated with him on the directorate included Lord Meston, Sir Austen Chamberlain, and Sir Philip Dawson. The Trust has been financed by the Utilities Power and Light Corporation (U.S.A.), and, as will be remembered, it acquired control of Edmundson's Electricity Corporation, the Oxford Electric Co., the Shropshire, Worcestershire and Staffordshire Electric Power Co., and several other British power and electricity supply undertakings. Mr. Rogers was chairman of some and a director of many of these concerns. The interment took place on Monday last at Kensal Green cemetery.

*[International Rotogravure.*

**The late Mr. F. M. Rogers**

**Lt.-Col. Sir Frederick Hall, Bt.**—We regret to record the death of Lt.-Col. Sir Frederick Hall, Bt., M.P., which occurred on April 29th, at his London home at the age of 67. He was a director of a number of companies, including the County of London Electric Supply Co., Ltd., the South Metropolitan Electric Light and Power Co., Ltd., and a number of other electrical concerns.

**Mr. T. A. Mills.**—The death is reported, at the age of 49 years, of Mr. T. A. Mills, of Saltburn, who was formerly assistant superintendent at the works of the Brush Electrical Engineering Co., Ltd., Loughborough. Since 1926 he had held a responsible position with Pease and Partners, Ltd., at the Skinningrove Ironworks, Saltburn.

**Mr. A. Charlton.**—The death has occurred of Mr. Alexander Charlton, electrical contractor, at his home at West Hartlepool, at the age of 42 years. He had been in business for 21 years, and the first hundred houses built by the West Hartlepool Corporation were wired by him.

**Mr. McKenzie Dallas.**—The death occurred on April 29th at Burntisland, Fife, of Mr. McKenzie Dallas, superintending engineer of the Carron Company. His connection with the company began in 1922, and subsequently he had charge of many important extension schemes. In 1931 he supervised an extensive reconditioning and reboilering scheme in the works at Carron.

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**Will.—Mr. W. Lambshead,** a director of the Paignton Electric Light & Power Co., left £81,147 (net personalty £18,296).

# Financial Section

**New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares**

## New Companies Registered

**Lighthouse Electrical Co., Ltd.**—Private company. Registered April 30th. Capital, £9,000 in £1 shares. Objects: To carry on the busjness of manufacturers and merchants of electrical batteries, lamps, and all other electrical appliances, &c., and to acquire trade marks registered in the names of Berk & Dundas Fox, Ltd., and the goodwill of the business of the said company. The directors are: K. Baumgarten and J. Baumgarten, The Highlands, Farnham Common, Bucks, and Czecko-Slovakia; W. D. Fox, 89, Brighton Road, Coulsdon, and A. Berk, 17, Westmoreland Road, Bayswater, W.2. Registered office: 229/230, Berwick Avenue, Trading Estate, Slough.

**Wartburg Lamps, Ltd.**—Private company. Registered April 30th. Capital, £5,000 in 500 ordinary and 4,500 7 per cent. cumulative participating preference shares of £1 each. Objects: To adopt an agreement with Gluhlampenfabrik Germania Eisenach, G.m.b.H., and to carry on the business of manufacturers of electric bulbs for motor cars, pocket lamps and cycles, radio fuse bulbs, fancy electrical illuminating strips, &c. The permanent directors are: H. C. Blaxland, 41, Connaught Road, Harlesden, N.W.10; C. E. Gleminson, 12, Denbigh Road, West Ealing, W.13; J. E. Macpherson, 5, Holly Mount, Hampstead, N.W.3, and P. Sprenger, 10, Ofenstein, Eisenach, Germany. Registered office: 5, 6 and 7, Dysart Street, Finsbury Square, E.C.2.

**Maldon Electric Securities, Ltd.**—Private company. Registered April 27th, with a nominal capital of £100 in £1 shares. Objects: To carry on the business of investors, financiers, bankers, underwriters, brokers, insurers, agents, land developers, manufacturers and merchants of electrical goods, owners of public utility undertakings, &c. The first directors are: J. P. Sadd, "The Bower," Maldon, Essex, and two others. Registered office: Station Road Wharf, Maldon, Essex.

**Portable Electric Power Co., Ltd.**—Private company. Registered April 29th. Capital, £72,000 in 60,000 8 per cent. cumulative preference shares of £1 and 240,000 deferred shares of 1s. each. Objects: To acquire certain inventions of S. A. Pollock, relating to improvements in electric storage batteries and patent rights in connection therewith, and to carry on the business of electricians, electrical engineers, suppliers of electricity, &c. The directors are: S. A. Pollock, Little Bush House, Kingsbury, W.9, and six others. Registered office: Quadrant House, 55-58, Pall Mall, S.W.1.

**Eric Smith & Co., Ltd.**—Private company. Registered April 29th. Capital, £500 in £1 shares. Objects: To acquire the business of an electrical engineer carried on by E. Smith at 55, Birchfield Road, Handsworth, Birmingham, as "Eric Smith and Co." The directors are: E. B. Smith, 168, Churchill Road, Handsworth, Birmingham, and R. Bain, 78, Hampton Road, Birchfields, Birmingham. Registered office: 55, Birchfield Road, Handsworth, Birmingham.

**Automatic Telephone Manufacturing Co., Ltd.**—Private company. Registered April 30th, with a nominal capital of £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in automatic and other telephones, telegraphs, wires, cables and lines, electrical and mechanical engineers, &c. The subscribers are: V. Summers and E. Rudland, 2, Bond Court, E.C.4. Registered office: Norfolk House, Norfolk Street, Strand, W.C.2.

**Vine & Weeden, Ltd.**—Private company. Registered April 27th. Capital, £250 in £1 shares. Objects: To carry on the business of electrical contractors, workers of and dealers in electrical fittings, telephones, wireless apparatus, dynamos, accumulators, &c. The directors are: R. G. Vine, 297, Norwood Road, S.E.24, and S. E. Weeden, 56, Portsmouth Road, Surbiton, Surrey. Solicitors: Spring & Co., 12-13, Henrietta Street, Strand, W.C.2.

**Twickenham Electrical Wholesalers, Ltd.**—Private company. Registered April 29th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical goods, components or accessories used in the electrical trade, &c. The subscribers are: J. W. Skelsey, 52, Killieser Avenue, Streatham Hill, S.W.2, and Winifred L. Sabatini, 58, The Green, Twickenham.

## Returns of Electrical Companies

**Electrical Power Engineering Co. (Birmingham), Ltd.**—Capital, £5,000 in £1 shares. Return dated December 1st (filed December 30th), 1931. 2,695 shares taken up. £1,350 paid, £1,345 considered as paid. Mortgages and charges, nil.

**Pembrokeshire Electrical Power & Distribution Co., Ltd.**—Satisfaction to the extent of £1,300, on March 15th, of debentures authorised July 7th, 1930, and registered July 15th, 1930. (According to the register of mortgages, the debentures registered July 15th, 1930, originally secured £2,000.)

**P.H. British Electrical Works, Ltd.**—Charge on land and buildings at the back of 56-74, Auckland Hill, Hubbard Road, West Norwood, dated April 5th, to secure all moneys due or to become due from the company to the Westminster Bank Ltd.

**Zeleo, Ltd.**—Particulars filed of £500 debentures authorised April 5th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

**W. D. Foster & Co., Ltd.**—Second debenture dated April 11th, to secure £2,400, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Watling Trust, Ltd., 52, West Street, Sittingbourne.

**Prescott & Hodgkinson, Ltd.**—Particulars filed of £900 debentures authorised April 5th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £100.

## City Notes

**The Calcutta Electric Supply Corporation, Ltd.,** reports a net revenue, after providing for depreciation, of £431,770, as compared with £473,030 in the preceding year. To this is added £40,491 brought forward, making £472,260, and, after deducting debenture interest, &c., and placing £50,000 to reserve for taxes and £50,000 to general reserve, it is proposed to pay a final ordinary dividend of 7 per cent., making 12 per cent. for the year, less tax (same), together with a bonus of 3d. per share, less tax (against 5d. per share), leaving £39,674 to be carried forward. The dividend is maintained on an ordinary share capital which is 20 per cent. higher than in 1930. It is proposed to grant to the staff in India a bonus equivalent to 2 per cent. of the Indian net profit, in respect of approved service actually rendered in 1931. The sales of electricity increased from 171,665,056 kWh to 177,752,613 kWh. The report states that trade depression continued to be acute, particularly in the jute industry. The revenue was also affected by the reduction in the domestic flat rate, which operated from June, 1931, and which, in present circumstances, has not yet resulted in the increased consumption anticipated. Meeting: May 9th.

**The British Power & Light Corporation (1929), Ltd.,** which controls the North Wales Power Co., Ltd., Electricity Distribution of North Wales & District, Ltd., and a number of English distribution companies, reports that the gross revenue of these companies for 1931 amounted to £373,420, as compared with £330,754 in 1930. After deducting expenses and transferring £59,151 to reserves for depreciation and renewals, there is a balance of £181,384. Interest, dividends, &c., require £174,931, leaving a balance of undivided profits of £6,453. The total undivided profits carried forward by the subsidiary companies amount to £49,385. The revenue received by the Corporation for the year ended March 31st last from dividends and interest paid and payable by its subsidiary companies, together with other receipts, amounted to £84,488, and the total consolidated earnings were £57,947. The net revenue for the past year amounted to £53,868, to which is added £47,866 brought in, making £101,734. The directors have applied £10,361 to writing off preliminary expenses, and recommend a dividend of 3 per cent., less tax, on the ordinary shares, leaving £55,317 to be carried forward. The sales of electricity by all the subsidiaries showed increases during the year, and the sales of energy during the first quarter of the current year show progress, despite the continuance of adverse conditions in certain of the companies' areas. The annual meeting will be held to-day (Friday) when a resolution will be submitted to shareholders for increasing the capital of the company to £2,800,000 by the creation of 800,000 new preference shares of £1 each.

**The North Wales Power Co.** reports that in spite of the continued depression of the slate quarrying and other industries, its sales of electrical energy in 1931, at £239,243, showed an increase of 3.7 per cent. over 1930. Operating and management expenses totalled £57,834, and after deducting debenture and interest charges there is a trading profit of £74,931, as compared with £60,848. Depreciation reserve receives £32,570 and £7,500 is placed to special renewals fund. It is proposed to pay a dividend of 4 per cent. (against nil) and to carry forward £44,812 (against £40,855). The connected load increased during the year from 44,649 kW to 48,548 kW.

**Electricity Distribution of North Wales and District, Ltd.,** reports a net profit of £17,641 for 1931, as compared with £12,733 in 1930, to which £1,374 brought in is added, making £19,015. The preference dividend absorbs £12,000, but no dividend is proposed on the ordinary shares, the amount carried forward being £7,015. The sales of electricity increased from 3,005,999 to 4,052,493 kWh.

**The North Somerset Electric Supply Co., Ltd.**—The annual meeting was held on April 26th, when Mr. H. B. Napier (chairman), who presided, said the two-part tariff was working satisfactorily and a reduction was being made in the "unit" charge. A hire-purchase department was to be established and a demonstration van had been acquired to tour their area demonstrating the domestic applications of electricity. Showrooms had been opened at Burnham and Street, and others were to be provided at Langport and Radstock. The report and accounts were adopted and at an extraordinary meeting which followed a resolution was passed increasing the capital of the company to £500,000 by the creation of 100,000 additional preference shares of £1 each.

**Pye Radio, Ltd.**—Presiding at the annual meeting on May 2nd, Sir Thomas A. Polson (chairman) said that although additional finance to meet the requirements of their rapidly expanding business had been discussed on several occasions in the course of the last two years, they had as yet arrived at no decision in the matter, though it was probable that in the near future they would do so. Mr. T. A. W. Robinson (joint managing director) said that their output of receiving sets during the past year was more than 2½ times that of the preceding year.

**Aktiebolaget Elektrolux.**—Preliminary figures and the dividend for 1931 were given in our issue of April 15th, p. 581. The directors' report, which has now been issued, states that the extensive changes in the Customs tariff policies of almost every country and the import restrictions placed on certain articles have necessitated a rearrangement of the manufacture of Electrolux products. In the course of the past year manufacture has to a large extent been decentralised by transfer to the factories of the company's foreign subsidiaries. These dispositions during the transition period have caused considerable extra outlays, which, however, are of non-recurring nature; the year's results have suffered as a consequence. The various factories have been relatively well occupied during the year. New models have been put on the market, including a small air-cooled refrigerator, which was put into production

towards the end of the year and which has since appeared on the European markets. The operations during the first quarter of the current year show improvement both as regards turnover and financial results upon the corresponding period of 1931.

**Associated Electrical Industries, Ltd.**—The annual meeting was held on April 28th, Sir Felix Pole (chairman) presiding. In presenting the report and accounts (see our last issue, p. 652), the chairman said that the reduction in the rate of dividend was due entirely to the fact that the directors decided to charge against profits all exchange losses in connection with trading and depreciation of investments overseas. Had there been a revival of trade this year, these losses would probably have been charged against reserves; but, as anticipations of trade revival had not materialised, it was decided to conserve the company's resources. Debentures in subsidiary companies held outside had decreased £1,485,298, the principal item being the repayment of the British Thomson-Houston 7 per cent. debentures. This was facilitated by Vickers, Ltd., and the International General Electric Co. providing ordinary capital at 21s. per share without underwriting. Having regard to the unprecedented nature of the events of the past year nationally and internationally and to the depression existing in many industries, the results might be regarded as satisfactory. They depended very largely upon the export market, and, despite the difficulties referred to, they secured a good share of export business. During the year under review they had continued their efforts to improve, cheapen and extend the various lines of apparatus. Referring particularly to the Metropolitan-Vickers Electrical Co., the chairman said that the year was distinguished by the number of turbo-alternators of 50,000-kW capacity and over which were installed. They also shipped to Rotterdam two 42,000-kW sets, the largest British-built sets supplied to the Continent. Repeat orders for two additional high-speed turbo sets of 32,500-kW capacity had been obtained from the Victoria Falls Power Co., while two 71,500-kVA sets for the Clarence Dock station, Liverpool, had been put into successful operation. The Montevideo power station, for which the company was the main contractor, was brought into operation during the year within sixteen months from the time the order was placed. Important orders for transformers, both for home and export, were received, and a number of large capacity had been completed for the Central Electricity Board. In the Traction Department, the apparatus for the electrification of the Southern Railway from London to Brighton was now in production. A notable contract received was for motors and control gear for thirty-six electric locomotives for the Hungarian State Railways. The order also included the complete equipment of four 110,000-V sub-stations.

[*Elliott & Fry.*

**Sir Felix Pole**

Valuable orders had been received for 132-kV switchgear from the Central Electricity Board, and the most notable delivery was the metal-clad 66,000-V switchgear for the London Power Co.'s Battersea station. Some interesting developments were the manufacture of circuit breakers of 2½ million kVA rupturing capacity for 161,000 V; 66,000-V switchgear for the Nile Delta pumping scheme; and, recently, an important order for the new Ford works at Dagenham. Their business in welding sets had steadily increased, and in the Meter and Instrument Department the development of a new line of switchboard instruments was completed during the year. Large orders were received for protective relays, and their house meters were growing in favour rapidly. Several high-frequency induction furnaces were installed; a one-ton furnace was in course of construction, which would be the first of this size to be installed in this country. Nine large Ward-Leonard winding engine equipments with a new type of slip regulator (described in this issue.—EDS.) were put on test at the Trafford Park works. Orders for rolling mills included one developing 21,000 h.p. on peak load. Throughout the year steady progress had been made in all sections of the Research Department. Continued progress had been made in the electric propulsion of ships, and while the new giant Cunarder was not designed for turbo-electric propulsion, the B.T.-H. Co. had secured an order for seven turbo-generators for auxiliary service.

They had been asked by the railway companies for their support in the efforts which were being made to secure equitable treatment in respect of road competition. They had no hesitation in extending to them a promise of such help, the more readily because the electrical industry also suffered from competition which it regarded as unfair. Leading companies, by their research activities and the expenditure of large sums of money in experimental work, were really responsible for the progress of the industry, and one of the difficulties which they had to face was the competition of small firms who merely copied their designs and methods of manufacture; there had been instances in which their customers had facilitated this form of piracy. In the result, productive capacity had been built up in many of the important branches of the industry in excess of requirements, a state of affairs which was not to the ultimate advantage of their customers, nor in the interest of the nation. Regarding future prospects, it was hoped that with more settled economic conditions a revival in trade might be anticipated. A gratifying feature was that Great Britain, alone among the industrial countries, showed a definite increase in electricity production during 1931.

**The Shanghai Electric Construction Co., Ltd.,** has announced a final dividend of 7½ per cent., tax free, making 12½ per cent. for 1931, against 12 per cent. for 1930.

**Bruce Peebles & Co., Ltd.,** held their annual meeting on April 27th, Mr. J. Watt (chairman) presiding. In presenting the report and accounts (ELEC. REV., April 22nd, p. 616) the chairman said that although they could not claim that the results were satisfactory, there was a substantial improvement on the preceding year. At the meeting last year he indicated that orders received to that date in respect of the current year were higher in value than for the corresponding period of the previous year. The improvement was not maintained, and the orders received so far this year were not adequate to reasonably satisfy their manufacturing capacity. They looked forward, however, to increased activity with some reason since there was increased purchasing power in the various industries at home and abroad which ought to lead to increased business. They had not completed any arrangements yet with regard to what the future arrangements were to be. They were sensible that the activities of the company had to be on a much broader scale than they had hitherto been. The works were as well equipped as any of their kind in the kingdom, and it would not involve any material capital expenditure in order to go into other branches of activity which in their view could be profitably undertaken by the company.

**The Scottish Power Co., Ltd.,** is making an issue of 600,000 six per cent. cumulative preference shares of £1 each at 23s. per share. The proceeds of the issue will be utilised in the repayment of a temporary bank loan incurred for the development of the company's properties, towards current expenditure on the Grampian Company's hydro-electric works, and towards further development expenditure on the various undertakings. The company has made steady progress, and dividends on the ordinary shares have been paid for the last ten years at the rate of 8 per cent. per annum.

**Babcock & Wilcox, Ltd.**—Presiding at the annual meeting on May 3rd, Sir John Dewrance (chairman) said that despite unprecedented adverse conditions during the past year they had secured their full share of the business that was placed. The returns of subsidiary companies were on the whole satisfactory. To reduce overhead expenses they were transferring works at Lincoln to Renfrew, Dumbarton and Albury.

At an extraordinary meeting which followed a resolution was carried altering the articles of association to ensure that the company shall always remain under British control.

**The County of London Electric Supply Co., Ltd.,** is making an issue of 896,337 new ordinary shares at 38s. 6d. per share to existing ordinary shareholders in the proportion of one new share for every five shares held.

**The Oriental Telephone & Electric Co., Ltd.,** proposes to pay a final dividend of 8 per cent. on the ordinary shares, making 12 per cent. for the year, tax free (same); a special "jubilee bonus" of 2 per cent., tax free, is also declared on the ordinary shares.

# Stocks and Shares

TUESDAY EVENING.

THE British Government has offered, this week, 3 per cent. Treasury bonds, with a maximum currency of ten years, for tender at a minimum price of 97¾. This has served to emphasize the firm tendency of gilt-edge securities. There is something of a famine in these latter. Borrowers are taking full advantage of the present-day conditions, and many new issues stand upon the point of being offered to the public. Central Electricity 4½ per cent. new scrip is 1 up at 8¾ premium. London J.E.A. new 4½ per cent. scrip is better at 1⅛ premium. Although the Home Railway Market has fallen upon evil days, the new debenture stocks of the Underground Railways are unaffected by the weakness in the prior charges of the steam lines group.

## The Two Metropolitan Debentures

It is true that Metropolitan District new debenture has lost ⅛ at 6½ premium, but this is due partly to the private placing of £300,000 stock at 101½, and partly to sales of the scrip against purchase of the Metropolitan Railway new 5 per cent. debenture, which at 4¼ is ¾ up. The jump in the price of "Mets.," which have gone up 8 points within the past fortnight, has brought the debenture stock into prominence. As matters stand at present, District debenture is the higher security of the two. But under the London Traffic Pool, any difference in status may become eliminated, as indicated here last month. Hence the straddle that has been taking place in the two debenture stocks. District ordinary stock is quiet at 51½. Underground Electric ordinary shares at 17s. 6d. have lost 6d., and now stand upon an 8 per cent. basis of yield, assuming the dividend to remain at 7 per cent.

## Electricity Supply Shares

County of London ordinary shares have weakened to 41s. 3d., a fall of ¼, on the announcement that the Company is making an issue of ordinary shares to the existing ordinary shareholders. For every five ordinary shares held, one new is to be allotted at 38s. 6d. per share. The issue will consist of 896,337 new shares, and provide the company with about £1,700,000 in cash. At the present price, the yield on the money comes to £5 1s. 8d. per cent., and the new shares are quoted at 1s. premium.

The provincial group is inclined to be dull. The Scottish Power Company is to issue 600,000 of 6 per cent. cumulative preference shares of £1 each at 23s. This will give the company nearly £700,000, which is required for the further development of the properties, and for repayment of bank advances. It is understood that of the 94,750 Scottish Power new ordinary shares which were privately taken last month, the greater part has now been placed on the basis of 27s. 9d., which is a little below the quotation for the old ordinary shares. The recently issued Electrical Distribution of Yorkshire 6 per cent. preference, issued at a guinea, are a firm market at 24s.

## Dominion and Foreign

The Calcutta Electric Supply Corporation did well in 1931, the profits, after depreciation of £431,770, being a few hundred pounds more than those of the previous twelve months. The ordinary dividend is again 12 per cent., this time, however, on a larger capital; the bonus of 3d. per share goes against 5d. in the previous year. The price of the ordinary shares is 39s. 6d., and the 5 per cent. preference, the dividend on which is paid free of tax, stand at 22s. 6d. The Shanghai Electric Construction Company is paying a final dividend of 7½ per cent. tax free, making 12½ per cent. for the year, an increase of 10s. per cent. The shares stand about 50s. The Sofina Company, in its annual report, reviews the economic crisis prevailing throughout the world, and states that the subsidiaries of the Sofina have been affected by these conditions.

## North Wales Power

The North Wales Power Company enters the dividend list with a distribution of 4 per cent. The profit of £186,725 is £11,000 up as compared with 1930, and £34,000 better than that of 1929. The company's 4½ per cent. debenture stock is included in the Trades Facilities Acts securities guaranteed by the British Government, and stands at 99½. The company's 10s. ordinary shares have been a very quiet market at 5s. 6d., but spurted, on the good dividend announcement, to 9s. They are difficult to buy.

Cawnpore Electric Supply Corporation maintains its usual dividend of 10 per cent. on the ordinary shares, and the profit of £79,300 shows a diminution of no more than £2,100 as compared with 1930. For this decrease, the principal reason is additional Indian taxation. The price of the ordinary is 27s., and the 7 per cent, preference are 21s. 3d. The company's 5 per cent. debentures, free of income tax, stand at 100. Whitehall Electric 7½ per cent. preference have further receded to 15s. Falls occurred in the shares of the A.E.G. owing to disquieting reports which were subsequently denied by the directors.

## Cables and Wireless

The disappointing traffic reported last month by the Cables and Wireless have brought about further falls in the three stocks of the combine. The 5½ per cent. preference has dropped 3 to 39½, while the "B" ordinary has given way to the option price of 8. The purchase of £100 of each class of stock would now cost about £60 altogether. The weakness of Cables & Wireless is reflected in a fall of 10s. to 6½ in Globe Telegraph & Trust preference. Marconi Marine continue on the downward path, the price now being 23s. 9d. Anglo-American Telegraph deferred stock is easier at 23. American Telephone & Telegraphs, at 135, are better by the amount of the deducted dividend, namely, 2¼ dollars gross for the past three months. International Telephone & Telegraphs at 8½ show a gain of the fraction. It is stated from Stockholm that a preliminary agreement has been reached between the International Telephone & Telegraph, and the L. M. Ericsson Telephone Company of Sweden, in connection with the loan of two million pounds sterling which the late Ivar Kreuger raised with the former company, on the security of the majority of the Ericsson Telephone "A" shares. The same statement adds that the International Telephone & Telegraph Company is to have transferred, to itself, the concessions of the Mexican Telephone Company.

Telephone Manufacturing shares have gone back to £2 7s. 2d.

## Manufacturing and Equipment

The meeting of the Associated Electrical Industries gave the chairman, Sir Felix Pole, an opportunity to explain that the reduction of the dividend from 6 per cent. to 4 per cent. was due to the Board's decision to charge against profits all exchange losses connected with trading and depreciation of investments overseas. This may be deemed by some shareholders as ultra-cautious, but the policy has a good deal to recommend it in such unsettled times as the present. The price of the shares is quoted, ex dividend, at 17s. 6d. General Electric ordinary have dropped to 35s. The dullness of equipment shares as a whole is again illustrated by the current week's prices. Henleys have receded to 5, Callenders to 52s. 6d., Johnson and Phillips went back to 18s. 9d., Siemens to 20s. 9d. Brush ordinary is back 2 points to 55. British Aluminium are lower at 23s. 3d., and Ever-Ready shares, in spite of the favourable character of the report, dropped to 24s. 6d. The Electric and Musical Industries directors have announced that a trading loss for the year must be expected. Home sales have exceeded expectations, but foreign business has been badly hit by unsettled conditions. The company is an amalgamation, of course, of the H.M.V. Gramophone Company and the Columbia Graphophone. Its shares were recently standing in the neighbourhood of 20s., but on the directors' announcement the price gave way to 9s. 6d., from which it recovered to a trifle above 10s.

## Miscellaneous Matters

Atlas ordinary are easier at 7s. 6d. The preference remain at 17s. 6d. Rumour discusses the possibility of the British Power & Light Company's creation of preference shares: the ordinary are 12s. 9d. Shawinigan Water & Power has declared a quarterly dividend of 25 cents, against the usual 50 cents. Hydro-Electrics have been fluctuating narrowly between 7¼ and 7½. The market in home iron, steel and engineering shares is dull, with Babcocks 1/16 lower at 42s. 6d., and Vickers easier at 6s. 6d. Rubber is fairly steady at 2d. per lb.

# Share List of Electrical Companies

| | Nom. | Approx. Dividend. 1930. | 1931. | Price. May 3. | Rise or Fall. | Yield p.c. £ s. d. |
|---|---|---|---|---|---|---|
| **HOME ELECTRICITY COMPANIES.** | | | | | | |
| Bournemouth and Poole | 1 | 15 | 15 | 60/9 | — | 4 18 9 |
| Brompton Ordinary | 1 | 8½ | 8½ | 28/– | — | 5 0 0 |
| Central Electricity 4½% Deb. | Stock | 4½ | 4½ | 95½ | — | 4 14 3 |
| Charing Cross Ordinary | 1 | 8½ | 8½ | 29/– | — | 4 16 7 |
| Chelsea | 1 | 8⅞ | 8⅞ | 26/6 | — | 5 5 8 |
| City of London | 1 | 10 | 10 | 37/6 | — | 5 6 8 |
| Clyde Valley | 1 | 8 | 7 | 28/3 | — | 4 19 1 |
| County of London | 1 | 11 | 10½ | 41/3 | –¼ | 5 1 8 |
| Edmundsons' 7% Pref. | 1 | 7 | 7 | 26/– | — | 5 7 8 |
| Elec. Dis. Yorkshire | 1 | 9 | 9 | 35/– | — | 5 2 10 |
| Elec. Supply Corporation | 1 | 11 | — | 47/6 | — | 4 12 7 |
| Kensington Ordinary | 1 | 8 | 8 | 28/6 | — | 4 18 3 |
| Lancs. Light and Power | 1 | 6½ | 7 | 26/3 | –9d. | 5 6 8 |
| London & Home Counties 4½% Deb. | Stock | 4½ | 4½ | 96½ | — | 4 13 3 |
| London Electric | 1 | 9 | 9 | 28/– | — | 5 0 0 |
| Metropolitan | 1 | 10 | 10 | 41/3 | — | 4 17 0 |
| Midland Counties | 1 | 7 | 7 | 28/3 | –6d. | 4 19 1 |
| Mid. Elec. Power | 1 | 8 | 8 | 30/6 | — | 5 5 0 |
| Newcastle-on-Tyne Ordinary | 1 | 6 | 6 | 23/3 | –6d. | 5 3 3 |
| Do. 7% Pref. | 1 | 7 | 7 | 27/6 | — | 5 1 10 |
| Northampton | 1 | 10 | 10 | 40/9 | — | 4 18 2 |
| Notting Hill 6% Pref. | 10 | 6 | 6 | 11 | — | 5 9 1 |
| North Met. Elec. 6% Pref. | 1 | 6 | 6 | 24/6xd. | — | 4 18 0 |
| St. James' and Pall Mall | 1 | 8 | 8 | 28/– | — | 5 0 0 |
| Scottish Power | 1 | 8 | — | 28/3 | — | 5 13 3 |
| South London | 1 | 8½ | 8½ | 28/– | — | 5 0 0 |
| Urban Ordinary | 1 | 7 | — | 28/– | — | 5 0 0 |
| Westminster Ordinary | 1 | 8½ | 8½ | 28/– | — | 5 0 0 |
| Whitehall Elec. Invst. 7½% Pref. | 1 | 7½ | 7½ | 15/– | –⅛ | 10 0 0 |
| Yorkshire Elec. | 1 | 8 | 8 | 33/9 | — | 4 14 10 |
| **HOME RAILS.** | | | | | | |
| Central London Ord. Assented | Stock | 4 | 4 | 72½ | — | 5 10 4 |
| Metropolitan | „ | 4 | 3½ | 39½ | +4 | 8 17 3 |
| Do. District | „ | 5 | 4½ | 51½ | — | 8 14 10 |
| Underground Electric | 1 | 8 | 7 | 17/6 | –6d. | 8 0 0 |
| **TELEGRAPHS AND TELEPHONES.** | | 1929. | 1930. | | | |
| American Tel. & Tel. | $100 | 9 | 9 | 140 | +5 | 6 8 7 |
| Anglo-Am. Tel. Pref. | Stock | 6 | 6 | 98½ | — | 6 1 10 |
| Do. Def. | „ | 1½ | 1½ | 23 | –¼ | 6 10 5 |
| Cables & Wireless 5½% Pref. | „ | 5½ | 5½ | 39½ | –3 | — |
| Do. A 7½% Ord. | „ | Nil | — | 12½ | –1 | — |
| Do. B Ord. | „ | Nil | — | 8 | –1 | — |
| Globe Tel. and T. Ord. | 10 | 10 | 8½ | 4½ | — | — |
| Do. do. Pref. | 10 | 6 | 6 | 6½ | –½ | 9 4 8 |
| Great Northern Tel. | 10 | 20 | 20 | 22½ | — | 8 17 10 |
| Marconi-Marine | 1 | 15 | 15 | 23/9 | –9d. | 8 8 4 |
| Oriental Telephone Ord. | 1 | 12 | 12 | 2⅜ | +⅛ | *5 1 1 |
| **HOME AND FOREIGN TRAMS, ETC.** | | | | | | |
| Anglo-Arg. Trams First Pref. | 5 | 5½ | — | 6/3 | — | — |
| Do. do. 2nd Pref. | 5 | 6 | — | 3/9 | — | — |
| Do. do. 5% Deb. | Stock | 5 | 5 | 9 | — | — |
| British Electric Traction Def. Ord. | „ | 5 | 5 | 700 | –25 | — |
| Do. do. Pref. Ord. | „ | 8 | 8 | 119½ | — | 6 14 0 |
| Brazil Traction | 100 | 8 | — | 11¼xd. | — | — |
| Brit. Columbia Elec. Rly. Pce. | Stock | 5 | 5 | 89½ | — | 5 11 9 |
| London & Sub. Trac. 5% Pref. | 1 | Nil | Nil | 3/9 | — | — |
| London United Tram Deb. | Stock | 4 | 4 | 57½ | — | 6 19 2 |
| Mexico Trams, 5% Bonds | — | 5 | 5 | 32½ | — | 15 7 8 |
| Mexico Light Common | 100 | Nil | Nil | 15½ | — | — |
| Do. 7% Pref. | 100 | 7 | 7 | 25½ | –4 | 27 9 0 |
| Do. 1st Bonds | — | 5 | 5 | 62½ | –7 | 8 0 0 |
| Victoria Falls Ord. | 1 | 15 | 15 | 57/6 | –9d. | 5 4 4 |
| Yorkshire (West Riding) | 1 | Nil | Nil | 5/3 | — | — |
| **MANUFACTURING COMPANIES.** | | | | | | |
| Assoc. Elec. Ord. | 1 | 6 | 6 | 17/6xd. | — | 4 0 0 |
| Do. Pref. | 1 | 8 | 8 | 28/3 | –6d. | 5 13 3 |
| Babcock & Wilcox | 1 | 15 | 14 | 42/6 | –⅛ | 6 11 9 |
| British Aluminium Ord. | 1 | 10 | 10 | 23/3 | –⅛ | 4 6 0 |
| British Insulated Ord. | 1 | 15 | 15 | 57/6 | — | 5 4 2 |
| Brush Ord. | Stock | 10 | 5 | 55 | –2 | 9 1 8 |
| Callender's | 1 | 15 | 15 | 52/6 | –⅛ | 5 14 3 |
| Do. 6½% Pref. | 1 | 6½ | 6½ | 23/9 | — | 5 9 5 |
| Crompton Parkinson Ord. | 5/– | 30 | 30 | 18/9 | — | 8 0 0 |
| Do. 8% Pref. | 1 | 8 | 8 | 27/6 | — | 5 16 5 |
| Edison-Swan 1st Pref. | 1 | 7½ | 7½ | 23/3 | — | 6 9 0 |
| Do. 5% Deb. | Stock | 5 | 5 | 89½ | — | 5 11 10 |
| Electric Construction | 1 | 5 | Nil | 7/6 | — | — |
| Enfield Cable Ord. | 1 | 25 | 25 | 3½ | — | 7 2 10 |
| English Electric | 1 | Nil | Nil | 8/9 | — | — |
| Do. do. Pref. | 1 | Nil | Nil | 10/– | — | — |
| Ever Ready | 5/– | 35 | 35 | 24/6 | –6d. | 7 2 10 |
| Ferranti Pref. | 1 | 7 | 7 | 22/– | — | 6 7 3 |
| G.E.C. Pref. | 1 | 6½ | 6½ | 26/– | — | 5 0 0 |
| Do. Ord. | 1 | 14 | 10 | 35/– | –⅛ | 5 14 3 |
| Henley's | 1 | 30 | 30 | 5 | –⅛ | 6 0 0 |
| Do. 4½ Pref. | 5 | 4½ | 4½ | 4½ | — | 5 0 0 |
| India-Rubber | 1 | Nil | Nil | 4/6 | — | — |
| Johnson & Phillips | 1 | 10 | 10 | 18/9 | –⅛ | 10 12 4 |
| Siemens Ord. | 1 | 7½ | 7½ | 20/9 | –6d. | 7 4 7 |
| Telegraph Construction | 12 | 10 | 7½ | 9 | — | — |

* Dividends paid free of Income Tax.

# Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

**1930**

29,560. "Process and apparatus for the protection of rectifiers against excess currents." F. Lutz. October 3rd, 1929. (370,405.)

35,439. "Electric circuit interrupters." Westinghouse Electric & Manufacturing Co. April 4th, 1930. (370,385.)

36,440. "Electric circuit interrupters." Westinghouse Electric & Manufacturing Co. December 3rd, 1929. (370,386.)

37,174. "Metallic vapour electric discharge apparatus." International General Electric Co., Inc. December 9th, 1929. (370,472.)

38,671. "Automatic regulation of the exchange power between inter-connected electric power stations." Akt.-Ges. Brown, Boveri et Cie. May 10th, 1930. (370,408.)

38,930. "Sealing structures for lead-in conductors in electric vacuum apparatus." British Thomson-Houston Co. December 26th, 1929. (370,443.)

39,052. "Electrical music systems, and method of operating the same." Radio Corporation of America. December 30th, 1929. (370,475.)

39,085. "Radio and other high frequency receivers." Marconi International Marine Communication Co., Ltd., and F. Woods. December 29th, 1930. (370,409.)

39,088. "Electrical transformers or similar inductive apparatus." British Thomson-Houston Co., Ltd. December 27th, 1929. (370,389.)

39,280. "Tuning means for radio receiving sets." K. Marggraf. December 31st, 1930. (370,413.)

39,320. "Electrical relay devices." Westinghouse Brake and Saxby Signal Co., Ltd. January 14th, 1930. (370,393.)

**1931**

6. "Electric switch of the pull-and-turn type. L. O. C. King. January 1st, 1931. (370,479.)

402. "Electrical control switchboards." W. A. Coates, C. H. Flurscheim, and Associated Electrical Industries, Ltd. January 5th, 1931. (370,444.)

447. "Multiplex high frequency systems." Kolster-Brandes, Ltd. (Kolster Radio Corporation). January 6th, 1931. (370,445.)

506. "Methods of and devices for sound reproduction." A. E. White (Radio Corporation of America). January 6th, 1931. (370,422.)

523. "Circuit arrangement for printing telegraph systems." C. Lorenz Akt.-Ges. January 8th, 1930. (370,424.)

524. "Apparatus for cooling high frequency apparatus, particularly electron-discharge devices." C. Lorenz Akt.-Ges. January 9th, 1930. (370,425.)

674. "High frequency signalling systems." Standard Telephones & Cables, Ltd., and V. J. Terry. January 8th, 1931. (370,449.)

675. "Continuously loaded electric signalling cables." Standard Telephones & Cables, Ltd., M. C. Field, and W. E. Hugh. January 8th, 1931. (370,450.)

936. "Ignition magnetos." J. Lucas, Ltd., and E. A. Watson. January 10th, 1931. (370,498.)

1,297. "Electrically heated water-heaters." General Electric Co., Ltd., E. Eaves, and F. C. Smith. January 14th, 1931. (370,507.)

1,482. "Holders or carriers for shades of electric and other lamps." J. Lawton & Sons, Ltd., and F. G. Martin. January 16th. 1931. (370,515.)

1,898. "Electric irons." R. Fleming. September 22nd, 1930. (370,526.)

2,029. "Electric motors." Horstmann Gear Co., Ltd., A. Horstmann, and B. G. Horstmann. January 21st, 1931. (370,531.)

2,072. "System for positively controlling the rates of rise and decay of the magnetism of an electromagnet or of an electric generator." British Thomson-Houston Co., Ltd. January 21st, 1930. (370,532.)

2,963. "Thermionic valves and circuit arrangements therewith associated." Telefunken Ges. für Drahtlose Telegraphie. January 29th, 1930. (370,541.)

3,045. "Electrical indicating and measuring instruments." T. W. Corbin. January 30th, 1931. (370,543.)

3,553. "Automatic secret telegraph systems." B. E. D. Kilburn (J. H. Smart). February 4th, 1931. (370,545.)

3,636. "Electrically operated clocks and time recorders." I. H. Parsons and A. E. J. Ball. February 5th, 1931. (370,546.)

3,664. "Electric signalling, indicating, or controlling system for railways or the like." Siemens & General Electric Railway Signal Co., Ltd., and C. H. W. Edmonds. February 5th, 1931. (Cognate application, 12,673/31.) (370,547.)

3,832. "Rectifying apparatus." British Thomson-Houston Co., Ltd. February 6th, 1930. (370,549.)

3,857. "Circuit arrangement for switching on and off subscribers' stations in telegraph installations." Siemens and Halske Akt.-Ges. February 7th, 1930. (370,551.)

4,074. "Indicating instruments used in connection with electrically actuated indicators." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt.-Ges.). February 9th, 1931. (370,557.)

4,126. "Ignition switching apparatus for use in aircraft." Scintilla Akt.-Ges. March 10th, 1930. (370,559.)

4,180. "Driving of dynamos on vehicles." P. Bossu. February 10th, 1930. (370,561.)

4,226. "Timing devices for electrical relays." R. W. Palmer. February 11th, 1931. (370,562.)

4,478. "Electrical resistances." Wunderlich & Konig Ges. February 13th, 1930. (370,565.)

4,724. "Wireless receiving system." H. H. Schotanus Steringa Idzerda. February 15th, 1930. (370,569.)

5,610. "Electric time switches." Igranic Electric Co., Ltd., and A. H. Mackley. February 23rd, 1931. (370,582.)

8,361. "Manufacture of electric cables." Felten & Guilleaume Carlswerk Akt.-Ges. March 22nd, 1930. (370,620.)

8,633. "Electric resistance furnace." E. F. Russ. March 20th, 1931. (370,628.)

8,634. "Electrically driven vibration and rolling massage apparatus." M. Schneidinger. March 22nd, 1930. (370,629.)

9,141. "Electric distribution systems." British Thomson-Houston Co., Ltd. March 27th, 1930. (370,637.)

9,433. "Antenna systems." Marconi's Wireless Telegraph Co., Ltd. April 9, 1930. (370,639.)

11,379. "Apparatus for electrically measuring the concentration of liquids." W. Crockatt & Sons, Ltd., and W. C. Crockatt. April 17th, 1931. (370,658.)

13,093. "Protective systems for alternating current circuits." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). May 4th, 1931. (370,682.)

13,149. "Electrically driven clocks." H. Seabrook (Kienzle Tazameter-und Apparate Akt.-Ges.). May 4th, 1931. (370,683.)

13,276. "Voltage surge indicators." British Thomson-Houston Co., Ltd. May 5th, 1930. (370,686.)

13,307. "Electric water-heating devices." H. W. Darby. May 5th, 1931. (370,687.)

13,416. "Device for holding electric lamps." H. E. J. Junot (*née* Lemaire). May 6th, 1930. (370,688.)

14,969. "Connection system for multi-grid valves." D. S. Radioaktienges. Loewes and P. Kapteyn. May 21st, 1930. (370,707.)

15,052. "Apparatus utilising the reflection of light for converting sound records or the like into electric current variations." British Thomson-Houston Co., Ltd. May 22nd, 1930. (370,708.)

15,056. "Radio communication systems." C. Soullie. July 30th, 1930. (370,709.)

15,237. "Stopping and starting mechanism for use with braking devices for machines driven by electric motors." Howard & Bullough, Ltd., and W. Wilson. May 23rd, 1931. (370,710.)

15,674. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. May 28th, 1930. (370,719.)

15,785. "Electric switches with dashpot retardation." C. M. Williamson. May 29th, 1931. (370,721.)

15,789. "Thermionic cathodes." M-O Valve Co., Ltd., K. A. Macfadyen, and J. W. Ryde. May 29th, 1931. (370,722.)

17,026. "Contact arrangements of electric circuit making and breaking devices." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. June 11th, 1931. (370,733.)

17,720. "Electrical conductors." J. C. Patrick. July 14th, 1930. (370,741.)

19,019 "Aerial systems." Marconi's Wireless Telegraph Co., Ltd. July 1st, 1930. (370,753.)

19,169. "Battery ignition systems for motor vehicles." R. Bosch Akt.-Ges. September 25th, 1930. (370,756.)

19,474. "Electric coupling systems for thermionic valve circuits." Hazeltine Corp. August 20th, 1930. (370,762.)

19,483. "Electric coupling systems for thermionic valve circuits." Hazeltine Corp. August 19th, 1930. (370,763.)

19,524. "Flywheel magnetos of internal combustion engines." R. Bosch Akt.-Ges. July 12th, 1930. (370,764.)

19,789. "Commutators for dynamo-electric machines." British Thomson-Houston Co., Ltd. July 10th, 1930. (370,767.)

19,879. "Coupling system for thermionic valve circuits." Hazeltine Corp. August 19th, 1930. (370,768.)

23,401. "Voltage smoothing devices." Telefunken Ges. für Drahtlose Telegraphie. August 20th, 1930. (370,790.)

24,557. "Transmission of signals over an electric power transmission network." British Thomson-Houston Co., Ltd. September 2nd, 1930. (370,804.)

25,539. "Electric device comprising a gas-filled discharge space." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 13th, 1930. (370,813.)

31,216. "Conducting devices for electrical ignition apparatus." R. Bosch Akt.-Ges. November 21st, 1930. (370,848.)

34,148. "Electrical signalling systems." Associated Telephone & Telegraph Co. December 11th, 1929. (Divided application on 36193/30.) (370,499.)

34,899. "Impulse transmitters for use in electrical signalling systems." Associated Telephone & Telegraph Co. December 11th, 1929. (Patent of addition not granted.) (Divided application on 36193/30.) (370,500.)

**1932**

899. "Electric signalling systems." Westinghouse Electric and Manufacturing Co. January 22nd, 1931. (370,859.)

1,375. Insulation of the windings of high tension dynamo-electrical machines." Siemens-Schuckertwerke Akt.-Ges. January 2nd, 1930. (Divided application on 93/31.) (370,426.)

# Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 28th:—

B.E.M. (lettering and design). No. 529,128. Class 8. Electric service meters.—British Electric Meters, Ltd., Morden Road, Mitcham, Surrey.

Culap. No. 530,117. Class 8. Electric cables and flexibles.—Derby Cables, Ltd., Alfreton Road, Derby.

Transwitch. No. 530,108. Class 8. Electric transformers.—Metropolitan-Vickers Electrical Co., Ltd., Bush House, Aldwych, W.C.2.

Hyflex. No. 529,296. Class 8. Instruments and apparatus for radio signalling, sound reproduction, thermionic amplifiers, electric gramophones in combination with radio receiving sets, &c.—Celestion, Ltd., London Road, Kingston-on-Thames.

Explorer. No. 529,406. Class 8. Radio-telephony receiving apparatus, radio-gramophones, and parts thereof.—Majestic Electric Co., Ltd., Tariff Road, Tottenham, N.17.

Celto. No. 529,296. Class 13. Electrodes and welding rods of ordinary metal.—Quasi-Arc Co., Ltd., 15, Grosvenor Gardens, Westminster, S.W.1.

Lissen. No. 530,313. Class 13. Electric motor horns.—Lissen, Ltd., Worple Road, Isleworth, Middlesex.

Telconax. No. 529,529. Class 13. Goods manufactured from india-rubber and gutta-percha. No. 529,530. Class 50. Electrical insulating substances made principally of bitumen.—Telegraph Construction & Maintenance Co., Ltd., 38, Old Broad Street, E.C.2.

# New Work for Contractors

## Particulars of new works and building schemes for the use of electrical installation contractors and traders

*Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

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**Barking.**—Houses (102), Upney Farm Estate, for U.D.C.; Grosvenor Construction Co., Ltd., 56, Buckingham Gate, S.W.1. Hotel, Gale Street; Barclay Perkins & Co., Ltd., Park Street, S.E.1.

**Barnard Castle.**—Installation of electric lighting in parish church; vicar.

**Barrow-in-Furness.**—Houses (250), Roosegate Estate; borough engineer.

**Bembridge** (Isle of Wight).—Re-erection of "East Cliffe" for Earl Fitzwilliam (£15,000).

**Bexley** (Kent).—Houses (880), Welling; Stevens & Sons.

**Birmingham.**—Library, Lichfield Street; city engineer.

**Blackpool.**—Houses (74), Highfield Road, South Shore; borough surveyor.

**Blaydon-on-Tyne.**—Houses (36), Winlaton; T. Masthilo, architect, Council Offices.

**Blyth.**—Houses (100); L. Leeper, borough engineer, Town Hall.

**Bolton.**—Cinema, Crompton Way (£20,000); W. & S. Bradley, architects, Wood Street.

**Brighton.**—Houses (300), Whitehawk Estate; Wilson, Lovatt & Sons, Ltd., Wolverhampton, contractors. Catholic Church, Wilson Avenue; G. H. Fowler & Shaw. Waterworks, Balsdean (£103,280); Corporation water engineer. Premises for General Accident Assurance Co., West Street; W. H. Overton.

**Bromley** (Kent).—Girls' school, Bromley Common; F. H. Wood, Gloucester House, 19, Charing Cross Road, W.C.

**Bury.**—Alterations to the Town Hall (£24,800); borough surveyor. Rebuilding premises, 52, Fleet Street, Bury, for Marks & Spencer, Ltd.; Bovis, Ltd., contractors, 43, Upper Berkeley Street, W.1.

**Carlisle.**—R.C. schools; Rev. Thomas A. Harker, The Rectory, Warwick Square.

**Chaddesden** (Derby).—Factory for Peek, Frean, Ltd., London.

**Chailey** (Sussex).—Houses; Frank Bedman, building surveyor, St. John's, Lewes.

**Chard.**—Houses (20); R.D.C. surveyor.

**Cheadle** (Staffs).—Houses (20); R.D.C. surveyor.

**Chelmsford.**—Offices, &c., New Writtle Street, for the Eastern National Omnibus Co.

**Cheltenham.**—R.C. schools; Overbury & Healing, architects.

**Chester.**—Houses (36), Upton Estate; Brown & Sanders.

**Choppington** (Northumberland).—School for the C.C. (£5,000); W. W. Tasker, architect, 17, Claremount Road, Newcastle.

**Coventry.**—Reconstruction of Empire Cinema; S. Roberts, architect, New Street, Birmingham.

**Cupar** (Fife).—Shops for Cupar and District Co-operative Society (£8,000); Walker & Pryde, architects.

**Dalbeattie.**—Three blocks of houses, with electrical work, for T.C.; M. Purdon Smith, architect, 95, Irish Street, Dumfries.

**Darlington.**—Church for the Rev. A. L. Nixon; C. W. Milburn, architect, Feethams, Darlington. New Majestic Cinema, Bondgate (£30,000); G. Dougill & Sons, builders, Chestnut Street.

**Deaf Hill** (Co. Durham).—Hotel for J. Nimmo & Sons; C. F. Burton, architect, Shipping Chambers, West Hartlepool.

**Derby.**—Bus station and central market (£85,986) for T.C.; Gee, Walker & Slater, contractors.

**Devil's Bridge** (Card).—Re-erection of Hafod Church; Rev. T. Noah Jones, vicar.

**Didsbury.**—Re-erection, Capitol Cinema, electrically equipped (£50,000); P. Cummings, architect, 51, King Street, Manchester.

**Doncaster.**—Houses (250), Intake Estate; Frank Haslam, Ltd., builders.

**Durham.**—Improvements to casual wards (£5,000); county surveyor.

**Eastbourne.**—Alterations to the Lansdowne Hotel, Grand Parade; Robinson, Garratt & Robinson.

**Eastleigh** (Hants).—Re-erection of Fair Oak Park mansion for H. G. Gough (£35,000).

**Essex.**—High school for girls, Romford (£44,265), and school, Dury Falls, Hornchurch; J. Stuart, county architect, Chelmsford.

**Exeter.**—Extensions, Royal Devon and Exeter Hospital (£40,000); secretary.

**Failsworth** (Lancs).—Racing track for the Oldham Greyhound Racing and Sports Co., Ltd.; Richard Parker, secretary, 3, York Street, Manchester.

**Fareham** (Hants).—Rebuilding the White Horse Hotel for Long & Co. (Southsea), Ltd., Portsmouth.

**Felling-on-Tyne.**—Housing scheme, Stoneygate Lane; C. W. Hall, architect, Council Offices.

**Gawthorpe.**—Electric lighting installation in church schools; P. D. Crossley, secretary, 24, Crossley Buildings, Chickenley Heath.

**Glasgow.**—Shops (6) and houses (48), Manresa Place and Edgefauld Road; housing director. Extensions, Hackhead Hospital; city engineer. Alterations for Caledon Pictures, Ltd.; C. J. McNair, architect, 112, Bath Street.

**Gloucestershire.**—Extensions, Cheltenham infirmary and nurses' home, for the P.A.C. (£8,000); county architect, Gloucester.

**Grimsby.**—Houses (100); H. G. Whyatt, borough engineer.

**Hawarden** (Cheshire).—Houses (50); R.D.C. surveyor.

**Herne Bay.**—Houses (31), Claremont Road; U.D.C. surveyor.

**High Wycombe.**—Reconstruction of three public houses for Wheeler's Wycombe Breweries, Ltd.

**Houghton-le-Spring** (Co. Durham).—Houses, Villa Housing Estate (25); A. H. Balmer, builder.

**Huddersfield.**—Houses (36); borough surveyor.

**Ilford.**—Houses (60), Freemantle Road; T. B. Goodwin, Ltd.

**Irish Free State.**—(Clonmel, Co. Tipperary).—Houses (110), Garrymore; J. T. Walsh, architect, Town Hall. (Dublin).—Housing scheme, Cabra housing area (£224,000), and Hanover Street (£139,000), for the Corporation. (Queen's Co.).—Houses for C.C. (£35,000).

**Kenilworth.**—Houses (24); Sholto Douglas, U.D.C. surveyor.

**Kent.**—Schools, Bexley Heath, Crayford and Hersden; county architect, Maidstone.

**Kingston** (Surrey).—Laundry equipment, Kingston and District Hospital (£6,670), for the P.A.C.; clerk, Kingston-on-Thames.

**Lanarkshire.**—Houses (32), Eastfield, Cambuslang, with electrical work, for the C.C.; P. C. Smith, housing engineer, 13, Clydesdale Street, Hamilton.

**Lancaster.**—Houses (102), Corporation Estate; Nicholson and Wright, Ltd. Senior school, Skerton (£17,225); A. O. Thoms, for Education Committee.

**Lanchester** (Co. Durham).—Houses (30), for the R.D.C. (£10,000); surveyor, Council Offices.

**Lincoln.**—Re-erection of electrical repair shop; Robey & Co., Ltd., Globe Engineering Works.

**Lockerbie.**—Cinema, Bridge Street, for a local syndicate.

**London.**—(Camberwell).—Houses (30), Basing Place; Church Army Housing, Ltd. (Chigwell).—Cottage estate (204 acres): L.C.C. architect. (Eltham).—Hotel £17,500), for Messrs. Beasley, Woolwich. (Finsbury).—Additions to Royal London Ophthalmic Hospital, City Road; Campbell Jones, Sons and Smithers. (Lewisham).—Extensions to Poor Law Institution (£63,250); L.C.C. architect. (Mottingham).—Cottage estate (244 acres); L.C.C. architect. (Westminster).—Extensions to the London Library, St. James's Square (£26,000); A. J. Davis, architect, Mewes & Davis, Conduit Street. (Walthamstow).—Factory, Lea Bridge Road; Commercial Structures, Ltd., builders, 38, Canal Road, Clerkenwell, N.1. (Chelsea).—Cinema, King's Road and Upper Manor Street; W. E. Trent, architect.

**Malton.**—Houses (50); U.D.C. surveyor.

**Mansfield.**—Senior school for the Borough E.C.; W. Thompson, borough engineer. Premises, Nottingham Road, for Whiteley, Boneham & Co., Ltd., and Cash & Co., Ltd. (Harwood).

**Melton Mowbray.**—Houses, Norman Street (40), and Victoria Street (24); U.D.C. surveyor.

**Middlesex.**—School, Chase Road, Southgate (£31,490); County E.C. Extensions to nurses' home, Clare Hall, Sanatorium (£9,700); county architect.

**Milnsbridge** (Near Huddersfield).—School; Lunn & Kaye, architects.

**Newcastle-on-Tyne.**—Extensions to C.W.S. premises, Welbeck Road; C.W.S. Architects' Dept., 90, Westmorland Road. Alterations to Royal Oak Hotel; J. W. Lowrey, builders, Corporation Street. Stores, Northumberland Street, for Marks and Spencer; Norman, Jones & Rigby, architects, Southport.

**Northampton.**—Operating theatre for the Manfield Orthopædic Hospital, Kettering Road; governors.

**Northfleet** (Kent).—Houses (200); U.D.C. surveyor.

**Norwich.**—Reconstruction of the Mitre Inn; R. G. Carter, builders, Drayton, Norwich.

**Peterborough.**—Telephone exchange; H.M. Office of Works, King Charles Street, S.W.1.

**Pontefract.**—Houses (50), Brotherton; R.D.C. surveyor.

**Reading.**—Telephone exchange extensions; H.M. Office of Works, King Charles Street, S.W.1.

**Reigate.**—Houses (78); borough surveyor.

**Ross.**—Houses (24), Brampton Road site, for U.D.C.; F. E. C. Davall, Ross, architect.

**St. Ives** (Cornwall).—Houses (31), Parc-an-Roper site, and near Trenwith House; borough surveyor.

**Sale.**—Houses (44), Sefton Road, Chapel Road, and Doveston Road; U.D.C. surveyor, Town Hall.

**Shelfield** (Staffs).—Church for the Rev. Father Basil; J. R. Deacon, builder, Algernon Street, Walsall.

**Slough.**—Houses (80), off Furnival Avenue; U.D.C. surveyor.

**Smethwick.**—Houses (250), Warley Estate; R. Fletcher, borough engineer, Council House.

**Southgate.**—Houses (66), Seafield Road; Park Estates, Ltd.

**South Shields.**—Bungalows (28), Tynedale Road; W. J. Robertson, builders, Mowbray Road.

**Stafford.**—Convalescent villas, mental hospital (£16,640), for Staffs Mental Hospital Board; clerk, Stafford.

**Sunderland.**—Housing scheme, Ford Estate; borough engineer, Town Hall. Rebuilding Avenue Theatre for Moss Empires, Cranbourne Street, W.C.2; W. & T. R. Milburn, architects, Fawcett Street.

**Swanscombe** (Kent).—Houses (124); U.D.C. surveyor.

**Tanfield** (Co. Durham).—Houses (40); U.D.C. surveyor, Council Offices.

**Torry** (Aberdeen).—Church, Grampian Road; W. E. Gauld, architect, 19, Diamond Street, Aberdeen.

**Truro.**—Extensions, including theatre, at the Royal Cornwall Infirmary; secretary.

**Tynemouth.**—Premises for the Tynemouth Savings Bank, 58, Saville Street, North Shields. Houses (301), near Silkey's Lane, for T.C.; W. E. Hall & Sons, builders, Low Fell, Gateshead.

**Wakefield.**—Dairy, Dewsbury Road, for the C.W.S.; C. F. Moxon, architect, 3, Regent Street South, Barnsley.

**Warrington.**—Elementary school (250 places), for the Rev. J. H. Clark, rector of St. Alban's Church; Wright & Hamlyn, architects, Patten Chambers, Winmarleigh Street.

**Wood Green.**—Factory, Wellesey Road; G. H. Goldsmith.

**York.**—Houses (12) and flats (8), Hope Street; F. W. Spurr, city engineer, Guildhall. Houses, Garrow Hill Estate; B. Parker, architect. School (£8,500), Thorne, for West Riding E.C.; education architect, Wakefield.